August 1948

Chemical Industries

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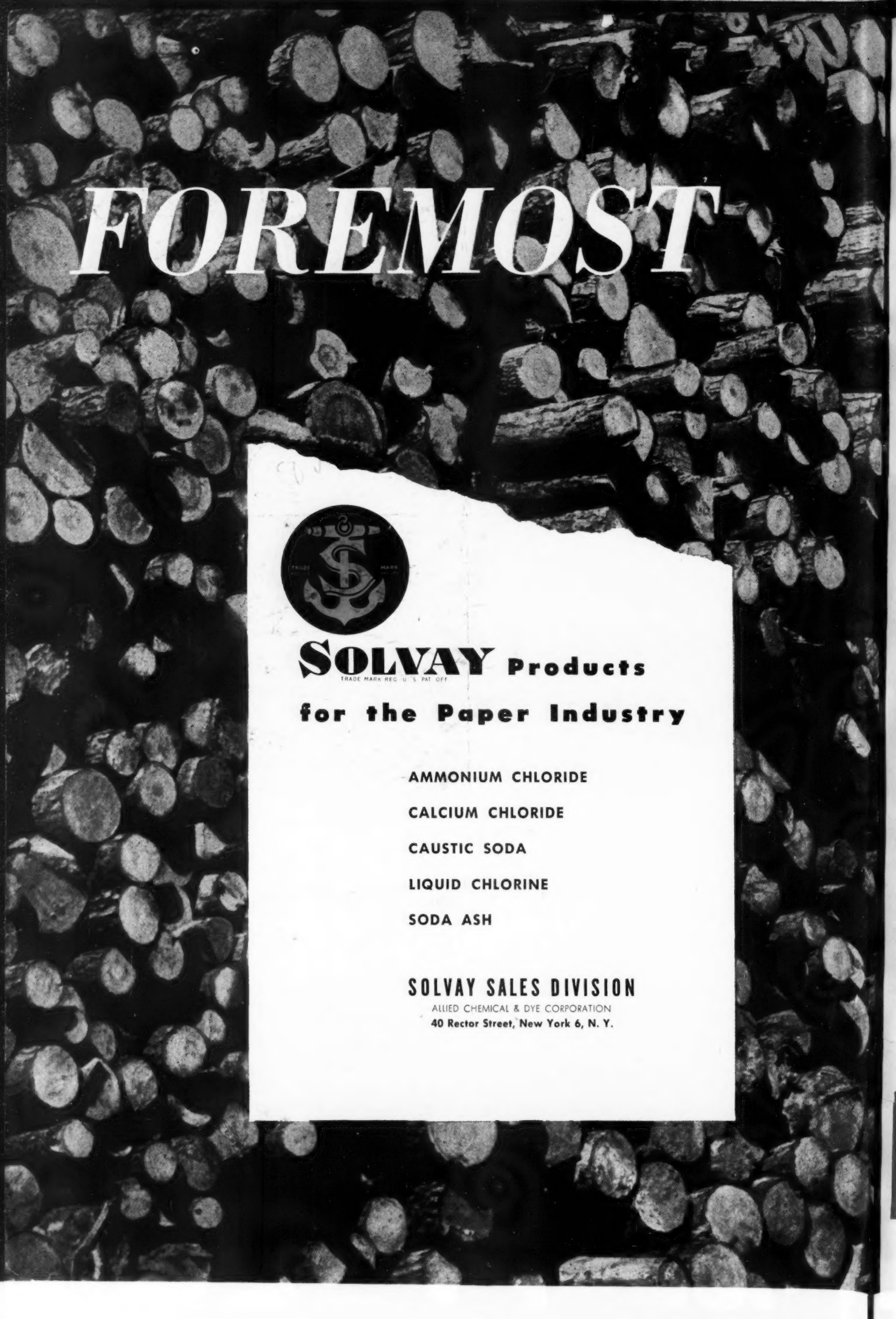
ACETIC ANHYDRIDE YEARLY OUTPUT NEARS BILLION POUNDS—p. 217

Cover: Control end, anhydride thermal cracking furnace



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SODA ASH

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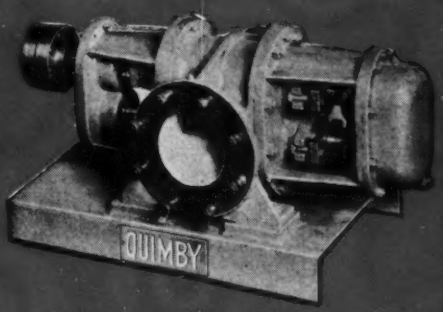
QUIMBY ROTEX PUMPS



Horizontal external gear and bearing type ROTEX Pump with accessible driving gears mounted at outboard end.

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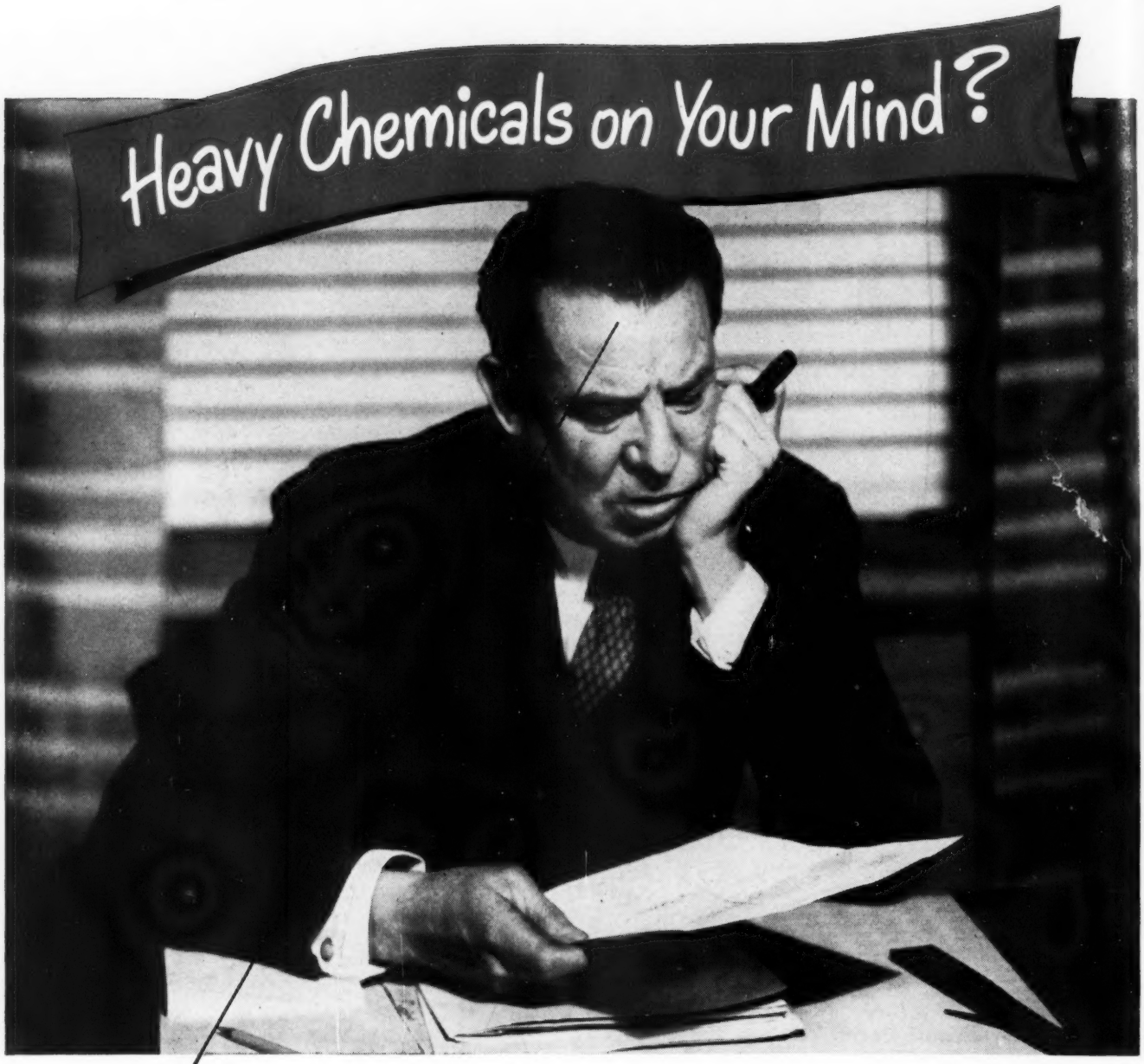

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Chemical Industries

"SERVING THE CHEMICAL PROCESS INDUSTRIES"

VOLUME 63—NUMBER 2 AUGUST, 1948

What's new ..... 209—216

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Phloroglucinol Expansion
Chemicals by Oxo
Dyes from Bizonia
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Cover: Tennessee Eastman Corp.

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Published monthly at 1309 Noble St., Philadelphia 23, Pa., and entered as 2nd class matter July 15, 1944, at the Post Office at Philadelphia 4, Pa., under the Act of March 3, 1879. Subscription $5 a year, $8 for two years, $10 for 3 years. Add $2 per year for postage to Latin America. Other foreign rates, except Canada, $15 one year, $30 for 3 years. Single copies 60c, except special issues. Canadian subscriptions and remittances may be sent in Canadian funds to Chemical Industries, P. O. Box 100, Terminal A, Toronto, Canada. Copyrighted 1948 by MACLEAN-HUNTER Publishing Corporation, 522 Fifth Avenue, New York 18, N. Y., Murray Hill 2-7888. Horace T. Hunter, President; E. R. Gauley, Vice-President and General Manager; J. L. Frazier, Secretary. OFFICE OF PUBLICATION: 1309 Noble Street, Philadelphia 23, Pa. EDITORIAL & EXECUTIVE OFFICES: 522 Fifth Ave., New York 18, Murray Hill 2-7888. DISTRICT OFFICES: Chicago: 309 West Jackson Boulevard, Chicago 6, Ill., Harrison 7890. Los Angeles: 1709 W. 8th St., Los Angeles 14, Calif., Fa-8576. San Francisco: 57 Post St., San Francisco 4, Calif., Yukon 1069. London: Sun Life of Canada Bldg., Trafalgar Square, London, S. W. 1, England.

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THE READER WRITES

Typographical Transmutation

To the Editor of Chemical Industries:

While looking through the ion exchange article in the May issue I noticed the following equation in Table 4 on page 758:

$$HgBr + NaCN = NaAg(CN)_2$$

Good trick if you can do it!

JOSEPH KOSLOV
Brooklyn 14, N. Y.

Mr. Koslov has better eyes than CI's proofreaders. We will henceforth leave transmutation to the alchemists and the Atomic Energy Commission. —EDITOR.

F.o.b. Pricing More Efficient

To the Editor of Chemical Industries:

Whatever the chemical producers decide to do about basing point pricing, I hope they do not make the error of claiming that the discontinuance of it would mean an increase in prices of chemicals. This claim has been made by some of the other industries that have changed to f.o.b. pricing and it is utterly false.

There is no reason why f.o.b. pricing should mean higher prices generally. It will obviously mean greater freight costs for consumers distant from producing points, but it will mean lower freight costs for those close to producing points. The overall effect should be to cut down on long freight hauls and thus reduce the total cost of distribution of the items concerned.

SAMUEL J. BURGESS
Newark, N. J.

Syntex Patents Belong to Parke-Davis

To the Editor of Chemical Industries:

I read with interest Dr. Howard C. E. Johnson's article regarding cholesterol in the June issue. May I offer an additional comment to the author's statement that patents are pending in the U. S. on the Syntex process for making synthetic hormones?

Actually Syntex bases their production in Mexico on the well-known Marker patents, which in the United States belong to Parke-Davis & Co. In Mexico they belonged to Mr. Marker himself and now to those firms to which he transferred them.

It may be that in addition Syntex has some complementary U. S. patent applications on file.

F. JONAS
Dr. F. Jonas Co.
New York 18, N. Y.

Centrifugals Added For Starch Separation

To the Editor of Chemical Industries:

You may be interested to know that we have made quite a few changes in our set-up for centrifugal separation of starch since the article that appeared in your January issue.

We now have five B-30 and three B-16 Merco centrifugals. We have three B-30's on first pass and two B-30's and a B-16 on second pass. The other two B-16's are used for clarifying the overflow of the second pass. This set-up is working very satisfactorily at the present time.

L. C. WATSON
The Hubinger Co.
Keokuk, Iowa

Believe It or Not

To the Editor of Chemical Industries:

Here's one for your "Believe It or Not" department.,

It is a State law in Tennessee that any material sold within the State that has a flash point of less than 110° F. is classified as gasoline and is susceptible to tax.

RODNEY WILLIAMS
Nashville, Tenn.

Credit Where It Is Due

To the Editor of Chemical Industries:

Early this year the Office of Technical Services released a report on the manufacture of acetic anhydride from acetylene in Germany. This report describes technical details of "German processes" for the oxidation of acetaldehyde to acetic acid and acetic anhydride. In the interest of accuracy, the process outlined was first described by Benson in 1934 before the Electrochemical Society.

It is regrettable that several of the OTS reports on German chemical processes have falsely implied that the processes were developed in Germany.

GEORGE W. WOODHEAD
Chicago, Ill.

Threat to Prosperity

To the Editor of Chemical Industries:

I was very pleased with your guest editorial by Mr. Munson in the June issue. The drying-up of risk capital is one of the more dangerous threats to our continued prosperity—and the chemical industry should be vitally concerned.

FRED CROMWELL
Philadelphia, Pa.

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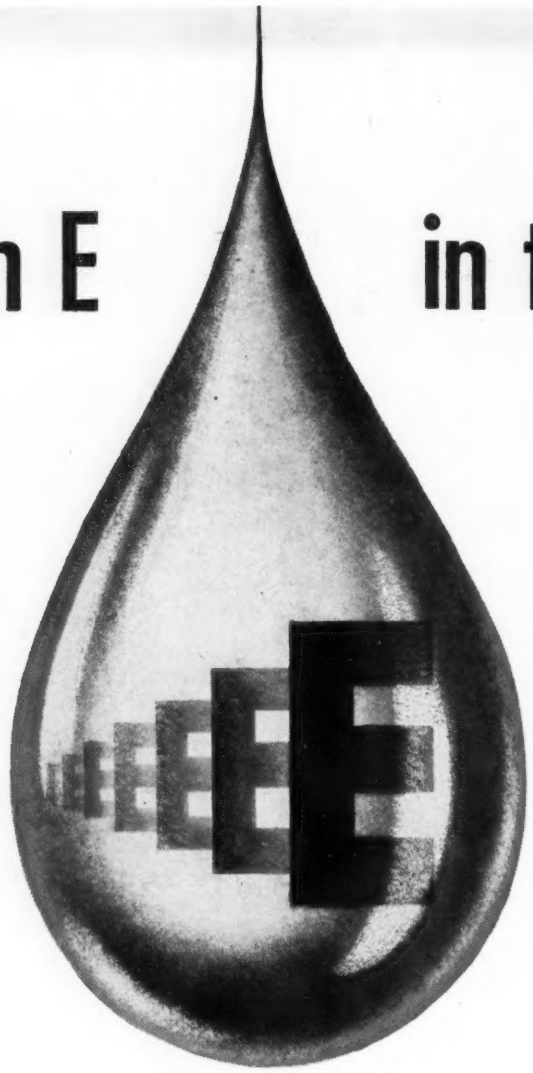

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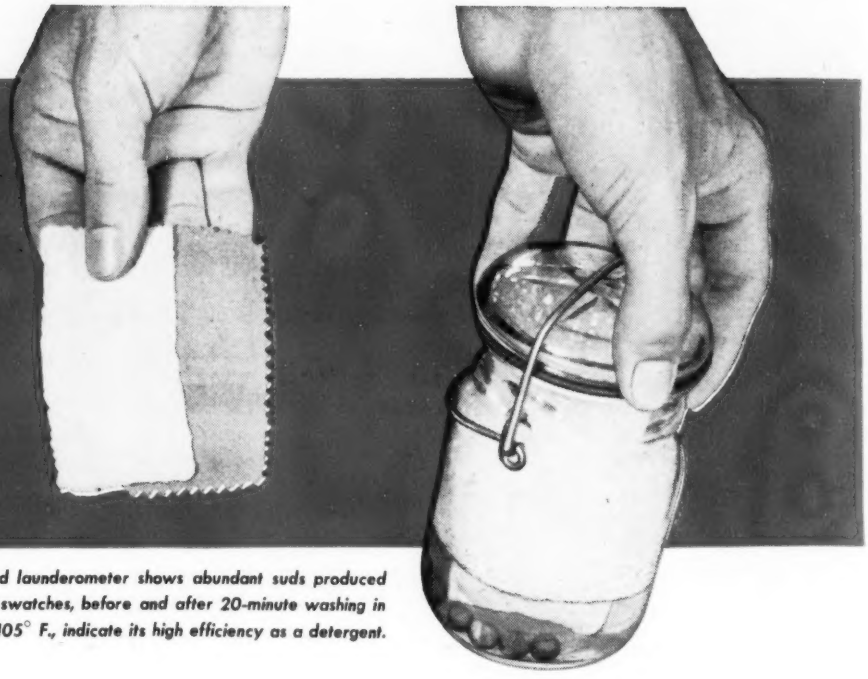

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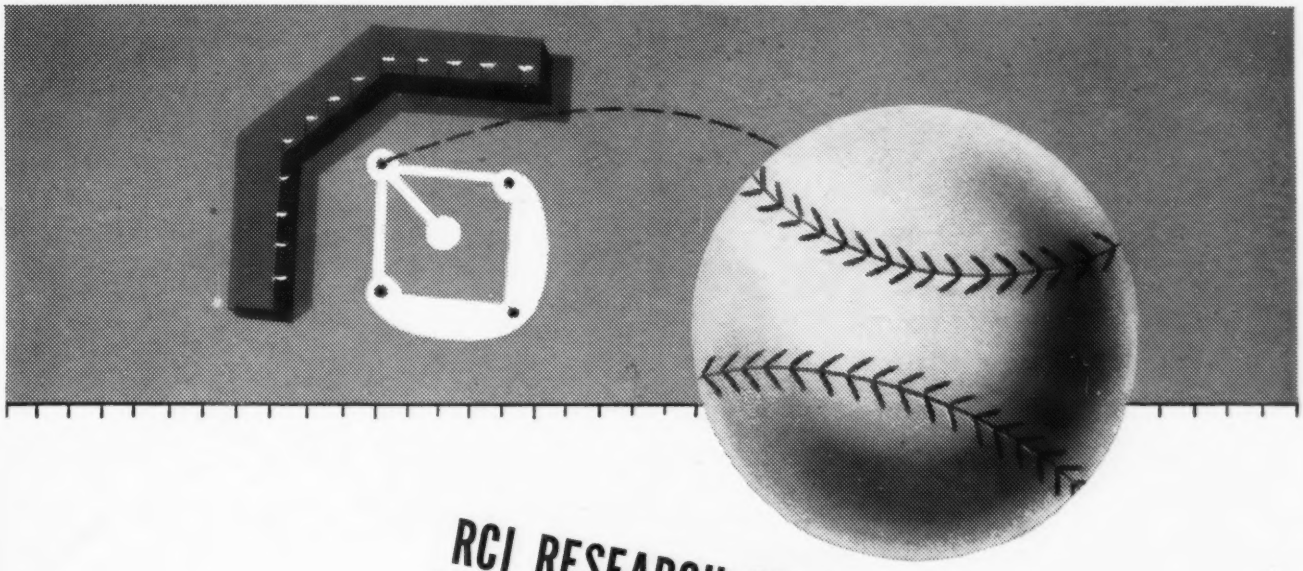

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Baker's Chemicals

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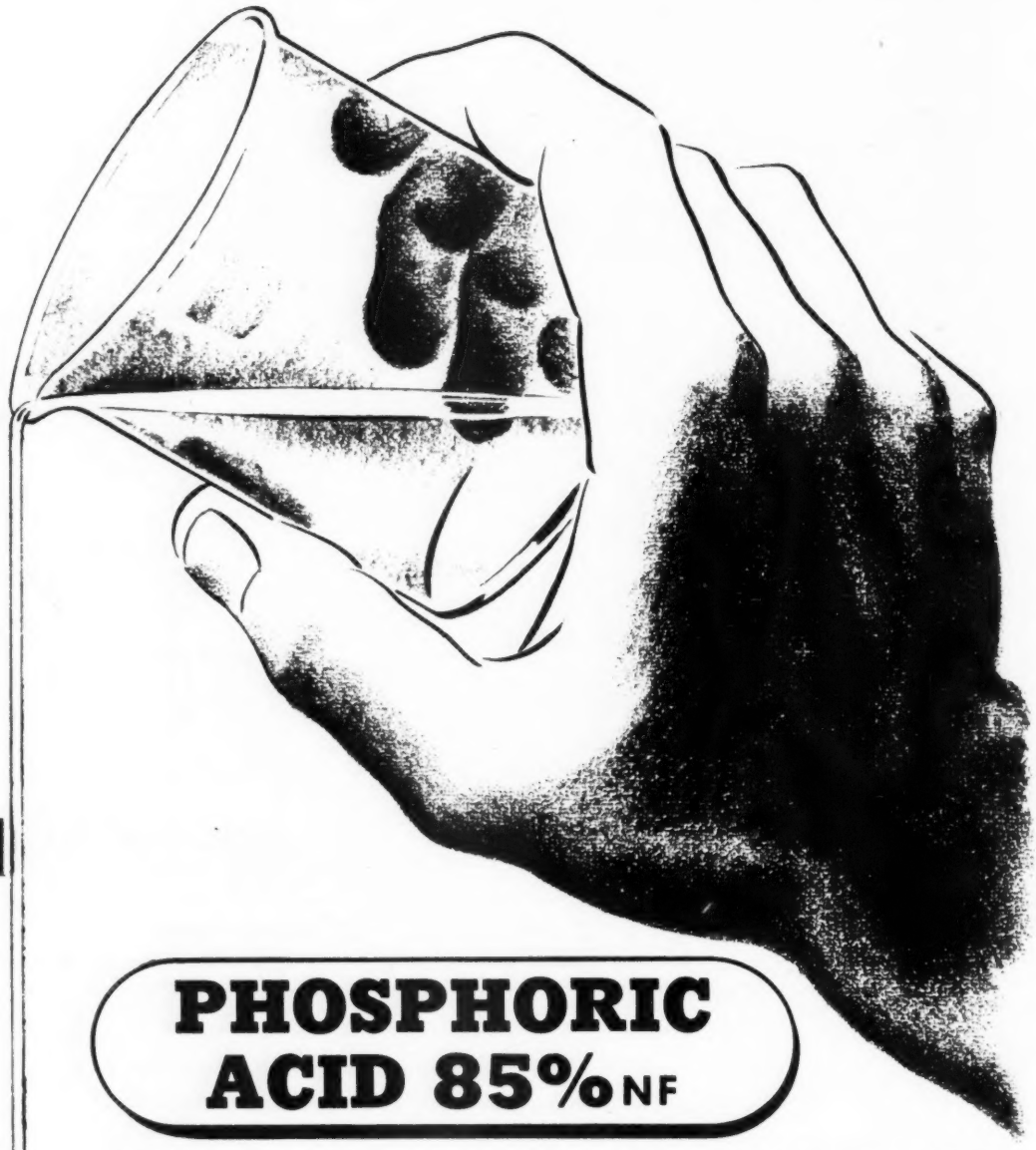

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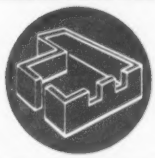	*1 Making water-repellent building materials?*	**CALCIUM STEARATE** — renders water repellent such materials as cement, cement composition, wood, brick, stone, fiber and fabric.
	2 Suspending pigments, producing "flatting" or increasing body in paints, lacquers, or varnishes?	**CALCIUM STEARATE** **ZINC STEARATE** — produce flatting effect in lacquers. **CALCIUM STEARATE** **ZINC STEARATE** **MAGNESIUM STEARATE** — increase body in varnish; prevent settling of pigments in paints and enamels.
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	4 Rendering crystals free-flowing and non-caking?	**CALCIUM STEARATE** — coats crystals against moisture.
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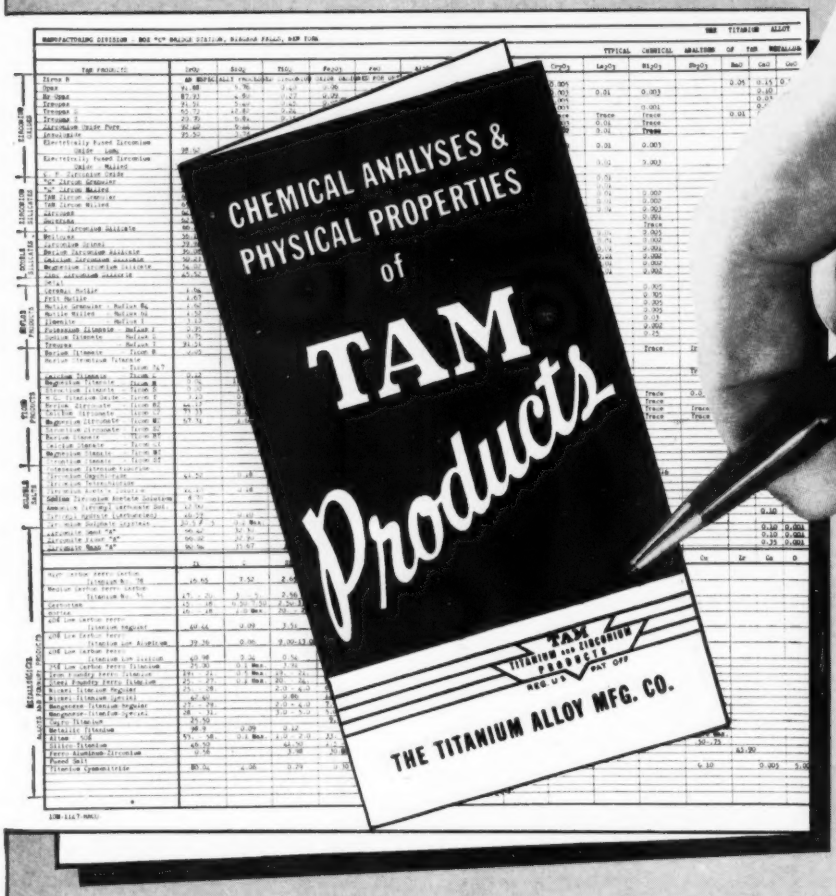

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DOUBLE CHECKED from RESEARCH to INDUSTRY

SHARSOL

FOR SOLUBILIZING 2,4-D ACID

ADVANTAGES:

- **Easy to formulate**
- **Will produce concentrates up to 60% basis 2,4-D**
- **Economical:**

  Reduces raw material and processing costs.

  Reduces shipping costs because concentrate contains more 2,4-D per unit weight.
- **Concentrate possesses:**

  Lower viscosity
  Lower freezing point
- **Available at once in drums or tank cars**

ASK US FOR SAMPLES AND FURTHER INFORMATION

SHARPLES TRADE MARK CHEMICALS

SHARPLES CHEMICALS INC.

PHILADELPHIA CHICAGO NEW YORK

SHARPLES SYNTHETIC ORGANIC CHEMICALS

PENTASOL* (AMYL ALCOHOLS) BURAMINE* (BUTYL UREA, Tech.)
ORTHOPHEN* (o-AMYLPHENOL)
PENT-ACETATE* (AMYL ACETATE) PENTAPHEN* (p-tert-AMYLPHENOL)
PENTALARM* (AMYL MERCAPTAN)
PENTALENES* (AMYL NAPHTHALENES)
ETHYLAMINE BUTYLAMINE
DIETHYLAMINE DIBUTYLAMINE
TRIETHYLAMINE TRIBUTYLAMINE
DIETHYLAMINOETHANOL TETRAETHYLTHIURAM DISULFIDE
ETHYLETHANOLAMINES 161 TETRAETHYLTHIURAM MONOSULFIDE
DI-sec-AMYLPHENOL TETRAMETHYLTHIURAM DISULFIDE
ZINC DIETHYLDITHIOCARBAMATE
ZINC DIMETHYLDITHIOCARBAMATE
ZINC DIBUTYLDITHIOCARBAMATE
SELENIUM DIETHYLDITHIOCARBAMATE
AMYL CHLORIDES o-tert-AMYLPHENOL o-sec-AMYLPHENOL
DICHLOROPENTANES DI-tert-AMYLPHENOL AMYL SULFIDE
DIAMYLPHENOXYETHANOL

* Trademark of Sharples Chemicals Inc.

SHARPLES CHEMICALS INC.

EXECUTIVE OFFICES: PHILADELPHIA, PA.
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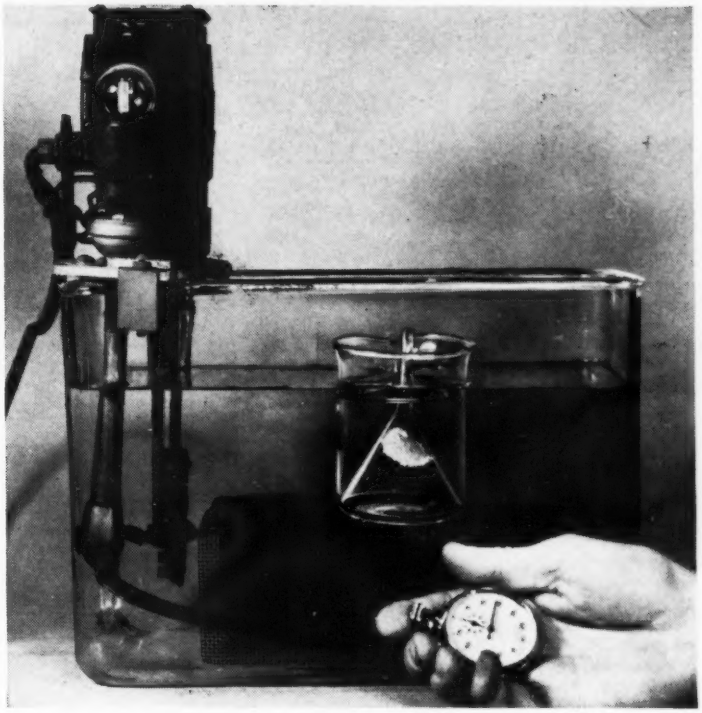
Mining Representative: ANDREW CLAUSEN, 1826 Herbert Ave., Salt Lake City 5, Utah
Canada: SHAWINIGAN CHEMICALS LTD., Montreal, Quebec . . Toronto, Ontario
Export: AIRCO EXPORT CORP., New York City

Wyandotte Kreelon



Wetting test showing a canvas disc sinking through a Kreelon solution. Without Kreelon, the sink time in distilled water is a matter of hours rather than seconds.

cleans as it wets

Closely related to thorough cleaning is efficient wetting out of materials not readily wetted by water alone. *Wyandotte Kreelon*, the versatile new synthetic organic detergent, is a highly effective wetting agent.

Kreelon penetrates, spreads, emulsifies and disperses as it wets. The great value of Kreelon lies in its ability to function well in acid, alkaline or neutral solutions, in hard or soft waters, alone, or combined in solutions and dry mixes with a great many other chemicals.

Because of these properties, Kreelon is recommended for use in the production of industrial and household cleaning compounds, textiles, leather, insecticides and paper products. It is also useful in several phases of coal and ore processing. In any operation in *your* plant where an unusual amount of time and labor is required in the wetting-out process—or where an economical spreading and emulsifying agent is needed —Kreelon can help you do a *better* job, *faster*.

Kreelon is only one of many chemicals and chemical compounds being produced under Wyandotte's $25,000,000 plant expansion program. These expanded facilities, coupled with more than half a century of experience, will enable Wyandotte to produce quality chemicals in even greater quantity than before.

Write for your free copy of the new 28-page booklet describing the properties and suggested uses of Wyandotte Kreelon.

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Wyandotte
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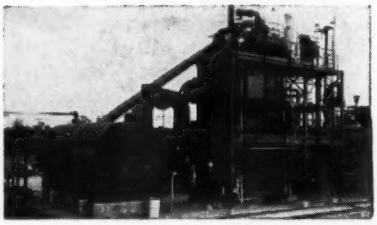
FOR YOUR INFORMATION



Improve your sulfuric acid production

If you are interested in the production of sulfuric acid, you can benefit by the many phases of Monsanto's long experience—both in the manufacture of sulfuric acid and the design of complete sulfuric acid plants.

Many sulfuric acid manufacturers have commissioned Monsanto's Engineering Sales Department to undertake the complete job of replacing obsolete units, to expand their capacity with new contact plants, or to supply vanadium catalyst. Economical operation is an outstanding feature of these Monsanto plants—they are simple in design, easy to operate, low in maintenance and produce acid of exceptional purity.

Standard units range in size from 10 to 500 tons of 100% acid daily, with no equipment in parallel.

Further information on any phase of this sulfuric acid plant design service will be supplied on request. Write Monsanto, Engineering Sales Department.

New laboratory unifies petroleum chemicals testing facilities

With the completion of its new Petroleum Chemicals testing laboratory in St. Louis, Monsanto offers to refiners and compounders complete technical service at one central location. The laboratory houses the latest equipment for projects ranging from usual chemical analyses to full-scale engine tests.

Engine facilities include five Chevrolet test stands, two single-cylinder Caterpillar Diesel stands and twelve Lauson single-cylinder engines, used to screen-test for the larger engines.

The chemical section is equipped to conduct stable pour-point analyses by cyclic temperature tests, channel point and rust protection tests of gear oils—plus analyses for metal, phosphorus, sulfur and chlorine.

ONE SOURCE FOR SYNTHETIC DETERGENTS AND WETTING AGENTS

1

- SANTOMERSE No. 1
- SANTOMERSE No. 3
- SANTOMERSE No. 3 PASTE
- SANTOMERSE D
- SANTOMERSE S

In the Santomerses, Monsanto offers a complete series of surface-active agents and detergents. These materials are the alkyl aryl sulfonate type, in flake, powder, paste and liquid forms.

In addition to being excellent wetting agents and detergents, the Santomerses are highly effective as penetrants, emulsifiers, dispersing, spreading and foaming agents. The Santomerses perform their important functions even under extreme conditions—they are remarkably resistant to decomposition by either strong acids or alkalies.

SANTOMERSE No. 1... The all-purpose detergent and wetting agent. Possesses in unique combination the following valuable properties: wetting out, dispersing, emulsifying, penetrating and cleaning action. Furnished either as flakes (for industrial use) or spray-dried beads (for household packaging).

SANTOMERSE No. 3... Combines maximum detersive action and emulsifying power with wetting—because of the relatively higher molecular weight of the alkyl group. Furnished as dry powder. 100% active.

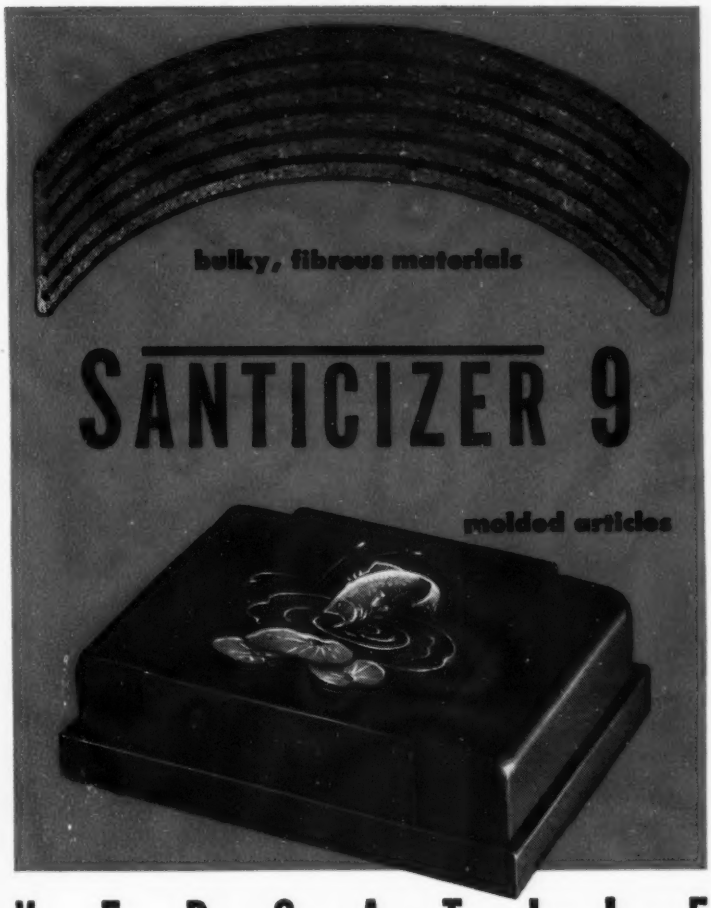
SANTOMERSE No. 3 Paste... Consists of 75% Santomerse No. 3 and 25% water. Convenient to use where a surface-active material is to be added to an aqueous solution.

SANTOMERSE D... Characterized by lower molecular weight of the alkyl group. Particularly effective where solubility, wetting, penetration and metallic ion stability are of primary importance. Furnished in powder form. 100% active.

SANTOMERSE S... A 30% aqueous solution of Santomerse D. Recommended where a surface-active material in liquid form is preferred.

If you would like complete application and technical data on the Santomerses, send for copies of Monsanto Application Data Bulletin No. P-118 (on Santomerse No. 1) and Monsanto Technical Bulletin No. P-123 (on the other Santomerses). Write to Monsanto, Phosphate Division, or ask for them on the coupon. *Santomerse: Reg. U. S. Pat. Off.*

News of Monsanto Chemicals for the Process Industries . . . . August, 1948



V E R S A T I L E

Manufacturers can benefit from the versatile applications of Santicizer 9. It can be used to advantage both in straight molding operations and as a plasticizer wherever thermosetting resins and bulky, fibrous fillers are to be combined.

As a plasticizer for phenolic and urea resins, Santicizer 9 lowers the viscosity at molding temperatures—without materially affecting the speed of cure—thus permitting better flow and more uniform molded articles.

This improved flow is especially valuable where a low concentration of resin is to be incorporated with a bulky filler. For example, brake band manufacturers find that it improves frictional and wearing qualities by *uniform* distribution of the binder resin in the asbestos fillers of the friction material.

Manufacturers who see possibilities for Santicizer 9 in their operations are invited to write to MONSANTO, Organic Chemicals Division. For information about the complete family of Santicizers, ask also for a copy of "Monsanto Santicizers . . . the quality-building plasticizing agents." Note your request on the coupon if more convenient.

DDT

SANTOCEL PROVES VALUE IN FORMULATING INSECTICIDES

Extensive tests conducted by Monsanto's Merrimac Division have proved the value of Santocel* (silica aerogel) as a diluent for DDT (Monsanto's Santobane*) and other insecticides. Laboratory research, plus field trials at agricultural experiment stations and recent full-scale industrial use, show that Santocel has the following advantages when used for this purpose:

1. ANTI-CAKING AID . . . A finely ground mixture of 10% Santocel C and 90% Technical DDT insures free-flowing characteristics over a long period.

2. DRY-GRINDING AGENT FOR DDT . . . Prevents solidification and clogging caused by melting of DDT due to heat involved in grinding process.

2. BULK ADJUSTMENT AGENT . . . Santocel can be used to increase the bulk of powdered materials. This is of value in packaging in small containers, or bulking to give more satisfactory coverage.

4. ABSORPTIVITY . . . Santocel can take up relatively large quantities of liquids and still remain as a solid material—an advantage in the manufacture of insecticide dusts that consist of an inert impregnated with liquid insecticides.

For complete information on Santocel applications in the insecticide field, write to Monsanto, Merrimac Division, Boston 49, Mass.

MONSANTO CHEMICAL COMPANY, 1703 South Second Street, St. Louis 4, Missouri. District Sales Offices: New York, Philadelphia, Chicago, Boston, Detroit, Cleveland, Cincinnati, Charlotte, Birmingham, Houston, Akron, Los Angeles, San Francisco, Seattle, Portland. In Canada: Monsanto (Canada) Limited, Montreal. *Reg. U. S. Pat. Off.*

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signposts to savings for CITRIC ACID USERS
Save on shipping expenses with CITRIC ACID ANHYDROUS
Save on storage, handling with CITRIC ACID ANHYDROUS

Anhydrous Citric Acid offers a more economical source of this acid, and at the same time you assure yourself of Pfizer quality. By using Pfizer Citric Acid Anhydrous you benefit from these savings:

First, you save on *shipping expense* because Pfizer Citric Acid Anhydrous contains no water of crystallization, and you pay freight only on the citric acid you buy and not on water! Figures show you pay freight on only 91.42 lbs. of acid instead of the full 100 lbs. of normal U.S.P. Citric Acid. This means over 8½% less on every freight bill!

Second, you save on *storage space* and *handling charges* because 10 drums of Citric Acid Anhydrous are equivalent to 11 drums of the U.S.P. acid. This means you eliminate one drum out of every eleven you formerly stored and handled.

Citric Acid Anhydrous is a granular product, identical in purity with the U.S.P. Citric Acid, and differs only in that it contains no water of crystallization.

Solutions prepared with Citric Acid Anhydrous are identical with Citric Acid U.S.P. provided, of course, that you make allowance for the water always present in the U.S.P. acid. And, unlike the U.S.P. Acid, the Citric Acid cannot dry out, thus overcoming any possible variations in the resulting acidity of your solutions. For further details, please inquire of Chas. Pfizer & Co., Inc., 81 Maiden Lane, New York 7, N. Y.; 444 West Grand Ave., Chicago 10, Illinois; 605 Third Street, San Francisco 7, Calif.

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Manufacturing Chemists Since 1849

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ABRIL 8 N S
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(M.P. 140°C)

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Used in Cosmetics, Cream Polishes, Emulsions of all kinds.

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Eimco Filters

For Chemical Process Plants

Eimco Continuous Vacuum Filters are designed and built to efficiently dewater the specific material handled in your plant.

Many years of experience in building quality filtration equipment, for the metallurgical, chemical and food processing fields, provides an unequaled background for construction of filters to meet specific needs.

Eimco filters are constructed of highest quality materials by experienced craftsmen. Each filter receives individual attention to assure efficient operation when the equipment is installed.

Write for more information on Eimco Continuous Vacuum Filters.

EIMCO

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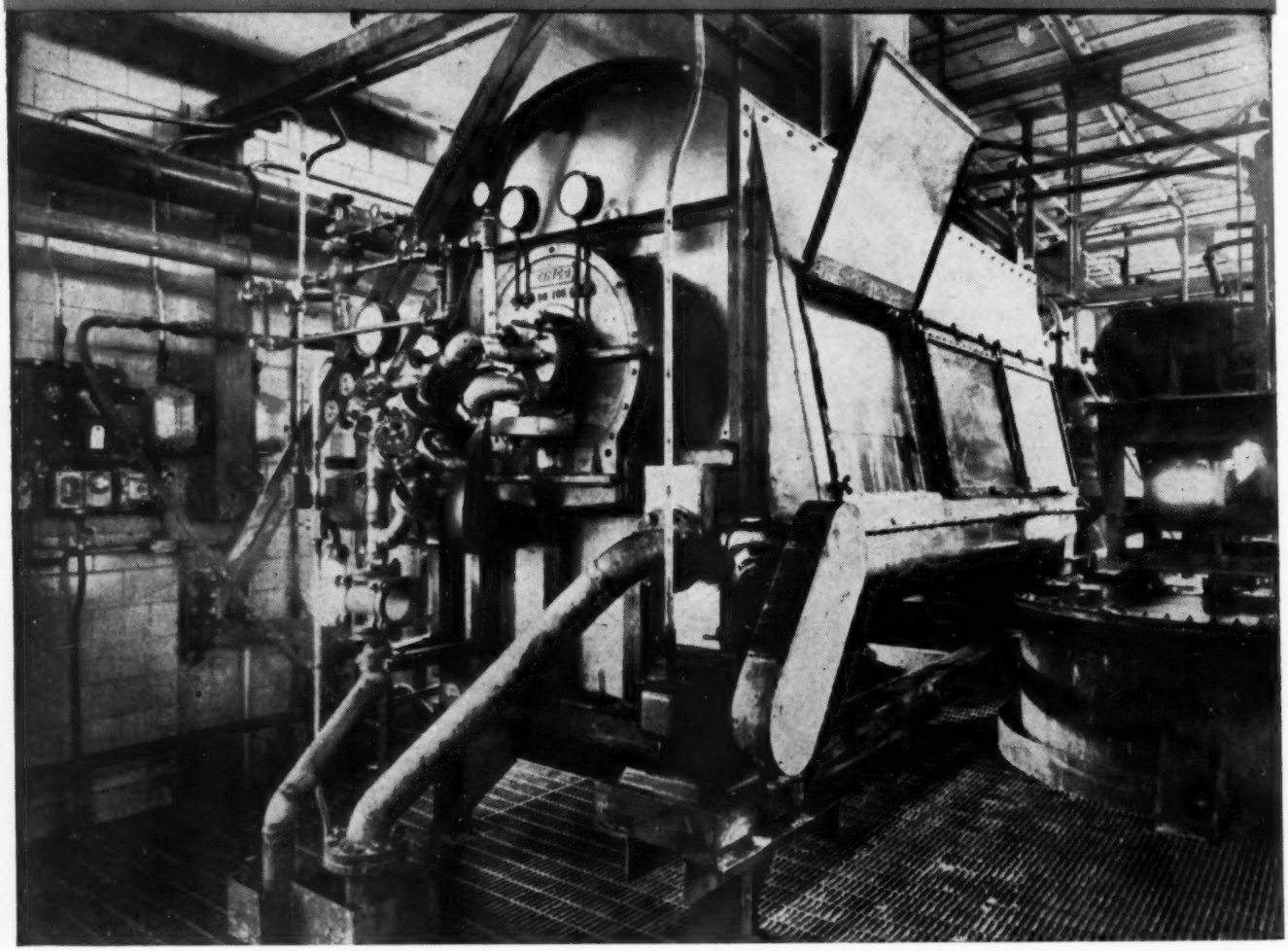


CELANESE* FORMALDEHYDE

Available in Greater Volume

Through expanding production facilities at the **CHEMCEL** plant, at Bishop, Texas, Celanese is making available increased quantities of organic chemicals vital to industry.

Formaldehyde, one of the most important products in the growing family of Celanese* Organic Chemicals, is now offered in greater volume. This high quality, U.S.P. chemical is sold commercially as Formalin, a water white solution containing 40% formaldehyde by volume, 37% by weight. It is obtainable in both methanol inhibited and uninhibited grades.

A clear, colorless liquid, controlled to meet exacting requirements, Celanese Formaldehyde is widely used in resins, adhesives and plastics, and in the production of various organic chemicals.

A brochure is available containing specifications and general information on many of the Celanese organic chemicals. Write for your copy—and call Celanese whenever you need technical assistance regarding organics.

CELANESE CORPORATION OF AMERICA
Chemical Division
180 Madison Avenue, New York 16, N. Y.

CELANESE* ORGANIC CHEMICALS NOW IN PRODUCTION:

Formaldehyde	n-Propyl Alcohol
Acetaldehyde	Butyl Alcohols
Acetic Acid	Methylal
Methanol	Special Solvents
Acetone	Tricresyl Phosphates

FOR LABORATORY EVALUATION, SCHEDULED FOR FUTURE PRODUCTION:

2-Methyl-1, 3-Pentanediol
Propionaldehyde

Celanese Chemicals*

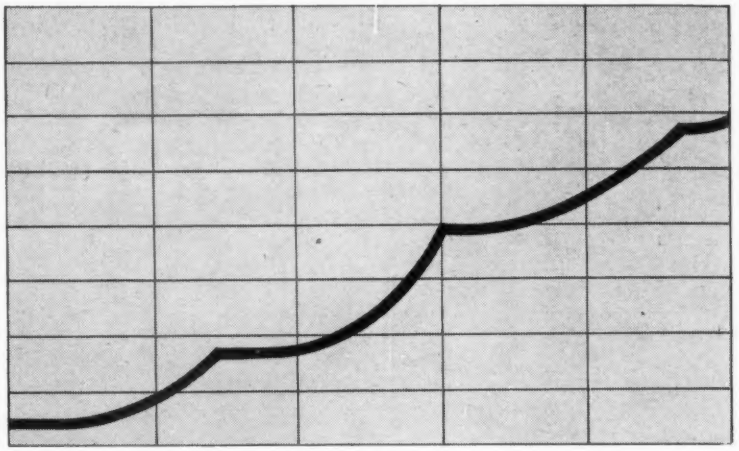
*Reg. U. S. Pat. Off.

ALCOHOLS • ALDEHYDES • GLYCOLS • KETONES • ORGANIC ACIDS • SOLVENTS • PLASTICIZERS • INTERMEDIATES

How are *your* raw material costs going?

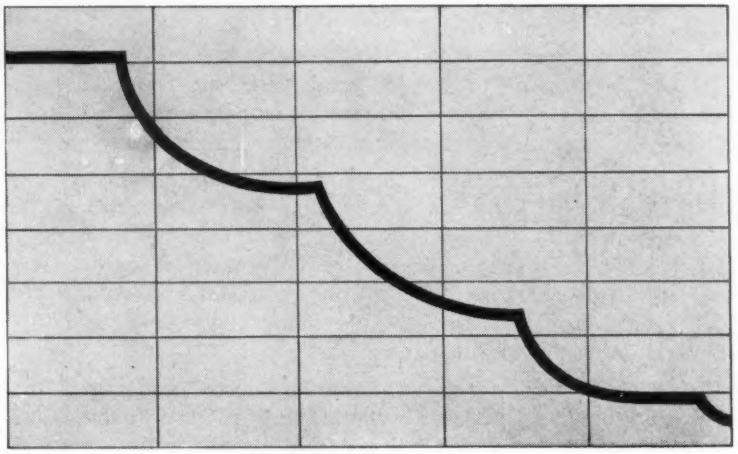
Most material costs
are going **UP**

like this . . .



SORBITOL'S
cost is going **DOWN**

like this . . .



And sorbitol is top value material for conditioning and synthesis.

Yes—Atlas sorbitol's price has gone down . . . steadily. But sorbitol's purity is higher than ever. It is one of the purest quantity-produced materials in the chemical market.

The new high-purity sorbitol means new opportunities in synthesizing such products as resins, drying oils and emulsifiers—and in protecting the freshness and flexibility of numerous other products. And the down, down, downward slide of sorbitol prices—brought about by stepped-up production—means you'll have all these advantages and a stabilizing effect on raw material costs as well.

SORBITOL is a polyhydric alcohol made in three grades—of great value in the processing of numerous products such as drugs—cosmetics—glue compositions—chemicals—textiles—foods—pharmaceuticals—paints and varnishes. Carload lots of sorbitol are ready now for prompt delivery. For information on how sorbitol applications can be of help to you, write for the Atlas Sorbitol book—or consult the Atlas technical staff.

ATLAS INDUSTRIAL CHEMICALS DEPARTMENT

CHEMICALS ATLAS EXPLOSIVES

ATLAS POWDER COMPANY, Wilmington 99, Del. • ***Offices in principal cities*** • ***Cable Address—Atpowco***

ANOTHER NACCONOL NR APPLICATION

Here's a Hot Tip: Use Wetter Water on Fires

So you think water is wet? Hah! Such old-fashioned ideas. The National Aniline Division has got something that is so wet it will give water a soaking. It's called Nacconol, a handy little chemical which can do to water what whisky will do to soda. Make it penetrating, that is.

Nacconol was given a brisk workout yesterday in a special demonstration at the foot of Court St.

A group of student firemen under the direction of George A. Leo, superintendent of fire apparatus, and Dr. O. M. Morgan of National Aniline lighted piles of old furniture and straw.

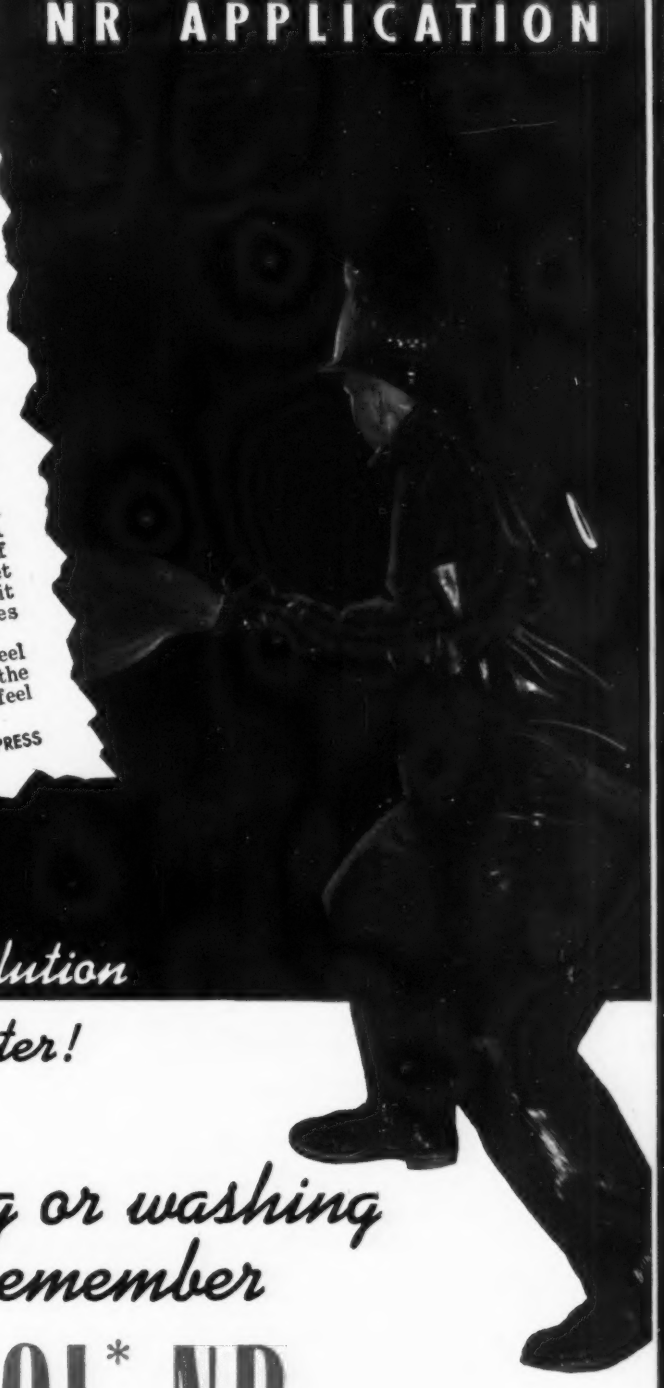
Then they sprayed the fire with water, just to show they haven't lost touch with the traditions of the past. The fire went out. But, and this is important, it smoldered. Another pile was set on fire.

This time the fire-fighters were using water wetted with Nacconol. The fire gave a half-hearted hiss and quit. It didn't even smolder as was the wont of the fires of yesteryear.

Nacconol, explained Leo and Dr. Morgan, goes right after Class A blazes. It gives water a quality of penetration which enables it to get right down in the pores where it can do battle with the flames readily.

So there it is. Next time you feel blue about getting soaked in the rain, think of Nacconol and feel good again.

BUFFALO COURIER-EXPRESS



1/8% NACCONOL *Solution*

Wets 3 Times Faster!

For any wetting or washing operation, remember

NACCONOL* NR

AMERICA'S LEADING SYNTHETIC DETERGENT

COSTS LESS THAN SOAP

DOES MORE THAN SOAP

WASHES • WETS • FOAMS • DISPERSES
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Let us show you how much NACCONOL NR can save you

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This kind of magic is easy!

NOTHING in your hands! Nothing up your sleeves! But look . . .

. . . out of your *present income* grows a wonderful future. There's a home in the country, college for your children, travel and fun for the whole family, even a comfortable retirement income for yourself.

And this is no trick, no illusion. *It really can happen!* It is happening right now for millions of wise Americans who are buying U. S. Savings Bonds *automatically* on the Payroll Savings Plan.

Here's how the magic works. All you do is sign up for the Payroll Plan. Then regularly, automatically, part of everything you earn is used to purchase Savings Bonds.

And magically, week after week, these *automatic savings* pile up the money *you'll need* to pay for the future *you want!*

Don't forget that every dollar you put into Savings Bonds is a "money-making dollar"—that $75 Bond you buy today will be worth $100 in just 10 years. And these Bonds play a big part in helping keep our country financially sound and strong, too.

They're always available at any bank or post office. But the surest way—the easiest way—to build financial security for your future is to buy them *automatically* on the Payroll Plan.

If you're not on a payroll, and have a checking account, you can still enjoy the magic of automatic saving with the Bond-A-Month Plan. Ask about it at your bank.

AUTOMATIC SAVING IS SURE SAVING—U.S. SAVINGS BONDS

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By standardizing specifications, manufacturing operations and testing methods for light oil distillates, Barrett is able to offer customers aromatic solvents and diluents which meet high standards of purity and reliability.

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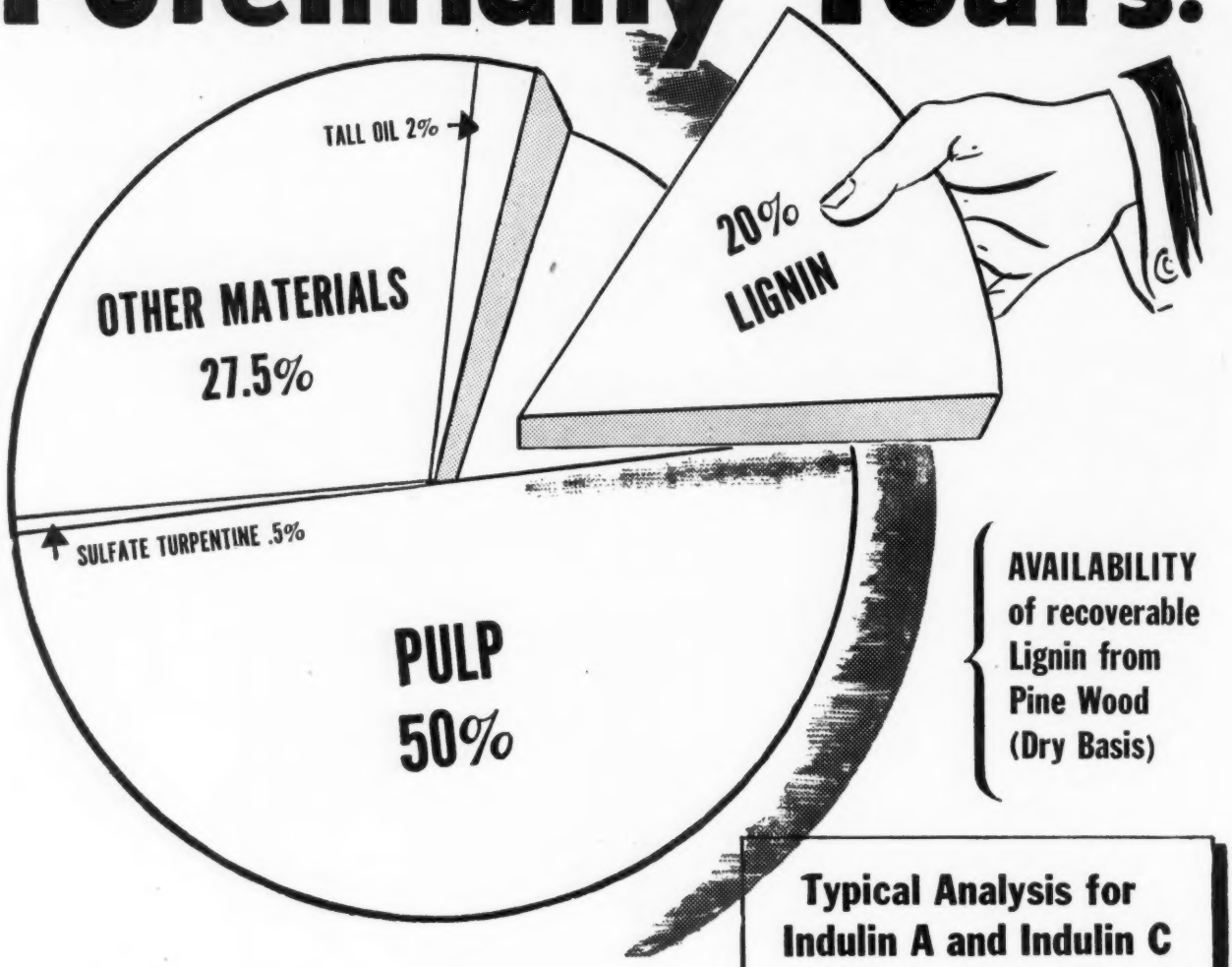

AVAILABILITY of recoverable Lignin from Pine Wood (Dry Basis)

● The production of lignin available from the kraft paper industry is estimated at about 800 pounds per ton of pulp. In 1947, there were potentially available over 2,000,000 tons of lignin from this source alone!

With such an abundant, inexpensive chemical raw material available, it will be of interest to investigators to know that INDULIN (our trade name for sulfate lignin) is now being produced in commercial quantities in two uniform reproducible grades.

Our Development Department will be glad to furnish a sample of INDULIN and technical data on its potential uses taken from their laboratory files. Suggested uses for INDULIN — Rubber, Printing Inks, Paper, Oil Well Drilling Muds, Plastics and Resins, Water Treatment, Detergents, Asphalt Emulsions, Ceramics.

Typical Analysis for Indulin A and Indulin C

TESTS (dry basis except moisture)	INDULIN A	INDULIN C
Moisture, %	4.3	8.3
Ash, %	0.4	19.1
pH	3.4	9.3
Methoxyl, % CH_3O	13.9	11.5
Sulphur, %	1.4	1.8
Apparent Density, lbs. per cubic foot	25.0	25.0
Specific gravity	1.3	1.3

industrial CHEMICAL SALES

division west virginia pulp and paper company

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Independence Square
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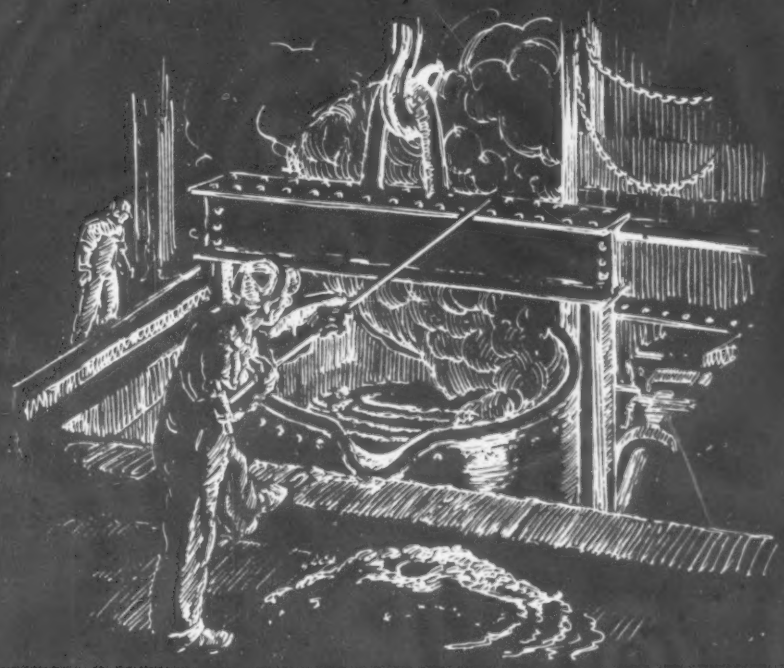
Snow Top Precipitated Calcium Carbonate—Nuchar Activated Carbons—Liqro Crude Tall Oil—Indusoil Distilled Tall Oil—Tallene Tall Oil Pitch—Tallex Abietic Acid—Sulfate Wood Turpentine—Alpha Pinene—Beta Pinene—Polycel Cellulose Fibers

STAUFFER CHEMICALS

FOR THE METAL INDUSTRY



Stauffer CHEMICALS SINCE 1885

Producers of metals and alloys are supplied promptly and efficiently with Stauffer Chemicals because Stauffer plants are strategically located through the country. Whether it's sulphuric acid for pickling, hydrochloric for purifying iron ore, nitric for etching or other industrial chemicals for innumerable uses in the manufacture of metals and alloys, you should investigate Stauffer's facilities as a dependable source of supply.

STAUFFER PRODUCTS

DDT—Dichloro-Diphenyl-Trichloroethane
BHC—Benzene Hexachloride
Chlorinated Camphene
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Carbon Bisulphide
Carbon Tetrachloride
Caustic Soda
Chlorine
Silicon Tetrachloride
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SETTING THE PACE IN CHEMICAL PURITY SINCE 1882

* Complete stocks are carried here.

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One of a series *of messages to help you increase your understanding of business paper advertising, and its effect on your business.*

Where are next year's profits coming from?

LABOR COSTS probably won't be any lower. Most materials, when you can get them, will still be costly. Yet no one in his right mind believes that profits can come from higher and higher prices. For that just makes *everybody* the loser in the end.

So the answer you hear most often is for all of us to *produce* more. To produce more efficiently. To so refine our mass production techniques that we can shave the last penny off the manufacturing cost per unit.

But that's not the *whole answer!*

The same principle must be applied to the *manufacture of a sale.* Because that's where business will find its best opportunities for profit — now and in the years to come.

With a buyers' market already in sight, it is time for business to re-examine the whole process of selling and distribution, and to improve the techniques of marketing its goods and services. The job is a tough one. It calls for streamlining, for more *mechanization* —which is simply another name for more aggressive and efficient advertising.

Skillfully employed, advertising is to selling what the assembly line is to production. It is a machine that increases the capacity of the sales force by the hundreds, or thousands, or by any quantity your market requires—exploring the field, arousing interest, creating a preference for your company and its products.

And nowhere does this machine operate at *higher efficiency* than in the business press, where it is concentrated among your best prospects—and no one else!

What are the ten ways to measure the results of your business paper advertising? You'll find the answers in a recent ABP folder, which we'll be glad to send you on request. Also, if you'd like reprints of this advertisement (or the entire series) to show to others in your organization, you may have them for the asking.

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is one of the 129 members of The Associated Business Papers, whose chief purpose is to maintain the highest standards of editorial helpfulness—for the benefit of reader and advertiser alike.

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U.S.I. CHEMICAL NEWS

August ★ A Monthly Series for Chemists and Executives of the Solvents and Chemical Consuming Industries ★ 1948

Develops MS-Soluble Alkyd Compatible With Amine Resins

Aroplaz 1081-M Helps Produce Quality Finishes at Lower Cost

Aroplaz 1081-M, a new mineral spirits soluble alkyd, compatible in all ratios with most melamine and urea resins, has been developed and is now being marketed by U. S. Industrial Chemicals, Inc.

This high viscosity, pure oxidizing medium-oil-length alkyd, for application by brush, dip or spray, can be used advantageously for industrial baking finishes, either alone or in combination with amine resins. It can be baked or air-dried without amine resins for industrial goods and general utility finishes.

High Package Consistency With Low Solids

Use of Aroplaz 1081-M will permit economical production of top quality finishes at considerably lower cost, because its very high viscosity allows preparation of such finishes at standard package consistency with much lower than usual vehicle solids content. Satisfactory enamel package consistency can be maintained with vehicles ranging as low as 33 to 36 per cent solids.

The resin can be used in white or colored formulations for industrial applications. Air-dried films based on Aroplaz 1081-M possess good initial color and gloss, as well as toughness, adhesion, and exterior durability. At the same time, the finishes exhibit much better "through dry" and gloss-retentive properties than conventional alkyds of similar oil length.

MORE

More Than Ninety Percent Of Low-pressure Aerosols Now Contain 'Pyrenones'

Concentrates Are Non-Toxic to Man and Animals —Free From Odor, Irritation, Fire Hazards

Pyrenone aerosol concentrates, made from technical piperonyl butoxide and pyrethrins, are present in more than ninety per cent of all low-pressure aerosol formulations, it was revealed recently. The new low-pressure aerosol bombs, in which U.S.I. pyrenones are essential components, are said to be simple and clean to use, and to destroy most household insect pests with very small amounts of spray. Obtainable from an increasing number of manufacturers, they are more economically priced than the more familiar high-pressure bombs.

Pyrenones Meet Low-Pressure Aerosol Requirements

Aerosols, as they were developed for the armed forces, and as they are most widely known by the public, are of the type more accurately termed "liquefied gas aerosols." They are made up of a mixture of gas or gases which liquefy under low pressures, and a concentrated oil solution of insecticide ingredients which is completely soluble in the liquefied gas. The weight ratio of the two lies generally in the range of 80-90 parts of gas to 10-20 parts of insecticide solution.

NEW LOW-PRESSURE AEROSOLS are economical, simple, clean to use. More than ninety per cent of them contain U.S.I. Pyrenones — non-inflammable, odorless products which are highly toxic to insects, non-toxic to man and animals.

To whatever extent is possible, it is required that the mixture of gas and insecticide solution be: (1) Highly insecticidal, requiring only small doses (e.g., 3.0 grams per 1,000 cubic feet) for control of common household flying insects. (2) Free from odor, irritation, or toxic hazards when man or animals are exposed to the aerosol mist. (3) Non-inflammable and otherwise safe for normal handling, storage, and use.

Pyrenones for the insecticide solution phase of aerosol formulations fulfill all these requirements. They consist of chemically and

MORE

New Cure Found For Blind Staggers

"Blind staggers" (selenium poisoning) of cattle can be counteracted by the amino acid, methionine, according to a disclosure made recently at a meeting of a prominent American scientific society.

Selenium poisoning has killed thousands of sheep and cattle in the dry plains of the west, the investigators state. Although notable progress has been made in preventing the disease by excluding selenate-containing soils from pasture and farming lands, "much work remains to be done on the mechanism of the disease."

The investigators found that methionine was capable of reversing the effect of the selenate. Moreover, they stated, "the evidence pointed to its action as being specific, for a definite relationship was found to exist between the methionine necessary to counteract a given amount of selenate."

THE AMERICAN HYDROCARBON SYNTHESIS: VIII

New Source Of Alcohols Provided By American Hydrocarbon Synthesis

The American Hydrocarbon Synthesis will provide a new industrial source of methyl, ethyl, and normal-butyl alcohol. From the process will also come commercial quantities of now hard-to-get alcohols such as isobutyl, normal-propyl, isoamyl, and normal-amyl. The availability of these compounds will stimulate their applications in the protective coatings, pharmaceutical, and other key industries, paving the way toward new developments.

Alcohols Widely Used

In industrial chemistry, no group of organic raw materials is more widely used than the alcohols. They are employed as solvents and solvent activators for a wide range of substances, and form an important class of intermediates. Products resulting from their chemical reactions have an even more extensive sphere of application than the alcohols themselves.

Up to the present, each member of this important alcohol group has been obtained from a separate source. For example, until recent years, methyl (wood) alcohol was distilled from pyroligneous liquors resulting from the destructive distillation of wood. During the last decade, however, the bulk of methyl alcohol has been prepared synthetically from the interaction of carbon monoxide and hydrogen. Ethyl alcohol is produced naturally from a fermentation process, or synthetically from ethylene gas. Fermentation provides a natural source for butanol; and the compound is also manufactured synthetically from acetaldehyde.

All Lower Alcohols From Common Source

The American Hydrocarbon Synthesis provides a single source for all three of these well-known alcohols. In addition to these compounds, the water-soluble stream of the process also supplies isobutyl alcohol, normal-propyl alcohol, isoamyl alcohol, and normal-amyl alcohol. These compounds today have limited commercial applications, but this is doubtlessly due to the lack of a large-scale source of supply.

Use of Lesser-Known Alcohols to be Stimulated

The establishment of a dependable commercial source of supply will stimulate the applications of these heretofore less used

MORE

ADVERTISEMENT—*This entire page is a paid advertisement*

August ★ **U.S.I. CHEMICAL NEWS** ★ 1948

CONTINUED Hydrocarbon Synthesis

lower alcohols. They will form a much desired complement to the three alcohols — methyl, ethyl, and normal-butyl — most widely used at the present. They will provide users with a greater choice in the selection of the proper solvent. Many specialty uses will be found for them, particularly for the amyls; and products synthesized from them will possess a wider range of physical properties.

Aid to Lacquer Formulators

An example of the potentialities of the new compounds is found in the case of normal-propyl alcohol. As one would expect from its position in the aliphatic alcohol series, its properties are midway between those of ethyl and normal-butyl alcohol. The properties of the esters of these three alcohols from the same acid bear similar relationships. This fact gives lacquer formulators greater latitude in establishing a balanced solvent composition.

Here is how it would work in an actual situation: The wide use of ethyl acetate and butyl acetate in lacquer formulations is well known. But propyl acetate, used in conjunction with them, will yield a solvent mixture more nearly uniform over its drying period.

Pure Normal-Amyl Alcohol

Normal-amyl alcohol, unmixed with other amyl alcohols, will be an important addition to the five-carbon alcohols. Nearly all commercial amyl alcohols at present are mixtures of the several five-carbon compounds. The fermentation product, for example, is a mixture of isoamyl and active amyl alcohols. The bulk of the synthetic amyl alcohols, obtained through the chlorination of pentane, are mixtures of amyl alcohols containing secondary and branched chain compounds.

Pure normal-amyl alcohol will provide better solvent power than the amyl alcohols now on the market. Wide application for this compound is anticipated in the drug and pharmaceutical industries, both as a solvent and as an intermediate. And, because normal-amyl esters of the lower aliphatic acids have better solvent powers for nitrocellulose than the secondary or isoamyl alcohols, the normal esters will be welcomed by the lacquer formulators as well.

Lower Normal Alcohols Available

U.S.I. will make a complete series of the low normal alcohols available from the water-soluble stream of the American Hydrocarbon Synthesis process. This is part of U.S.I.'s continually expanding program of service to industry. The date of availability will be announced in a forthcoming issue of *U.S.I. Chemical News.*

CONTINUED Low-Pressure Aerosols

entomologically standardized oil concentrates of technical piperonyl butoxide and purified extracts of pyrethrum. The ratio of piperonyl butoxide to pyrethrins and total concentration of the two is pre-determined by the performance characteristics desired in the finished aerosol, and includes consideration of any other insecticidal agent to be utilized in the formula. Nearly all conceivable preferences in the way of performance requirements are obtainable in pyrenone concentrates.

New Pamphlet On Low-Pressure Aerosols

A four-page guide to the formulation of low-pressure liquefied gas insecticide aerosols has just been published by the Insecticide Division of U. S. Industrial Chemicals, Inc. Second in a series designed to acquaint insecticide formulators, entomologists, and other users of insecticide materials with the properties and applications of U.S.I. products in this field, it discusses in detail the insecticide ingredient phase of aerosols. Copies may be obtained by writing the Editor of *Chemical News.*

CONTINUED MS-Soluble Alkyd

SPECIFICATIONS • AROPLAZ 1081-M

Non-Volatile: 49-51%
Solvent: Mineral Spirits
Viscosity (G.H.): Z_1-Z_6 (63.4-148 poises)
Acid Value (Solids): 6-10
Color, Solution (Gardner '33): 6-8
Wt. per Gal. at 25° (Solution): 7.65-7.75 Pounds
Wt. per Gal. at 25° (Solids): 9.20-9.30 Pounds
P.A. Content of Non-Volatile: 34% by weight
Oil Content of Non-Volatile: 50% by weight

TECHNICAL DEVELOPMENTS

Further information regarding the manufacturers of these items may be obtained by writing U.S.I.

A new soybean resin, described as a fine powder, light cream in color, with high adhesive strength, is claimed to be compatible with isolated proteins, caseins, latex, and various pigments. **(No. 349)**

A glass that carries an electric current, developed secretly for the Armed Forces during the war, is now commercially available. It is designed to eliminate icing and fogging of windshields and windows. **(No. 350)**

A new vegetable wax, alleged to have a melting point of 180-1 degrees F. and to possess high oil-retention value, is claimed to be useful in the manufacture of carbon paper and carbon ink. **(No. 351)**

To simplify odor control problems, a new kit is now offered which contains 12 different masking agents now used successfully to increase the marketability of products having unattractive odors. **(No. 352)**

Two new metal cleaners, said to be effective individually or in combination for cleaning a wide variety of metals and alloys, are claimed to be without harmful physiological effect. **(No. 353)**

An organic formulae stencil, designed to facilitate the drawing of complex organic structural formulae, is described as containing eight characteristic ring systems. **(No. 354)**

To soften automobile undercoatings, a new product has been placed on the market which will soften undercoating in six to seven minutes permitting it to be scraped off with a putty knife, the manufacturer claims. **(No. 355)**

A line of anti-mycotic papers is designed to reduce the loss suffered through the action of fungi and molds. When used either as a liner or other wrapper, these papers are claimed to retard mold growth on bread, spices, tobacco, leather goods, marmalade, licorice and other products. **(No. 356)**

A fluorescent acrylic plastic, now marketed for the first time, may be used for self-illuminating lettering, and other industrial and commercial uses, the manufacturers suggest. **(No. 357)**

A new germicide, claimed to be 25 times more powerful than carbolic acid, is described as neither toxic nor irritating to the skin. **(No. 358)**

A stainless steel flexible hose, said to be designed specifically for the chemical industry, conveys liquids, acids, chemicals, steam, air and gases, the makers state. **(No. 359)**

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*Super Pyro Anti-freeze
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Diamyl Phthalate
Dibutyl Phthalate
Diethyl Phthalate

OTHER ESTERS
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Diethyl Carbonate
Ethyl Chloroformate

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Acetoacet-ortho-anisidide
Acetoacet-ortho-chloroanilide
Acetoacet-ortho-toluidide
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Ethyl Benzoylacetate
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THE ARMEENS

The Armeens (aliphatic amines) and their water-soluble acetate salts, the Armacs, are used extensively as ore-flotation reagents and also as a base for many of the new high potency quaternary salt germicides. Other uses include: cationic emulsification, asphalt bonding, pigment grinding, synthetic detergents, and as penetrants and repellents.

THE ARMIDS

The Armids (aliphatic amides) are high-melting, wax-like nitrogen containing chemicals. They are used in printing inks as "all-weather" anti-scratch materials. Other uses include: emulsion stabilizers and thickeners, dye solubilizers for carbon paper, anti-blocks for plastics, chemical synthesis.

THE ARNEELS

The Arneels (aliphatic nitriles) are non-toxic organic cyanides. They are efficient softeners for certain synthetic rubbers or elastoprenes and synthetic rubber-like elastics or elastoplastics. Other uses include: rust preventatives, lubrication assistants for textiles, and water-proofing compounds.

THE ARQUADS

The Arquads (quaternary ammonium salts) are cationic in character and are water-soluble. They have excellent germicidal and surface active properties; are effective also as cationic textile softeners and ore flotation reagents. Other uses include: anti-static polishes for waxes, detergents, and alkaline cleaning compounds.

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The development of this market for automotive specialties is worth your constant attention.

Research . . . in solvents, polymers, emulsions, cleaners and other automotive maintenance chemicals . . . is pointing the way to many new products you can develop. Some are sure to spell real profits to you.

Carbide and Carbon Chemicals, a pioneer in aliphatic chemistry and now a supplier of over 200 industrial organic chemicals, continues to lead in research of this type. Our efforts are aimed at giving practical, down-to-earth assistance in the development of new products and the improvement of old ones.

Today, automotive upkeep takes huge quantities of anti-freezes; hydraulic fluids; shackle and top-cylinder lubricants; glass, tire, and metal cleaners; wax polishes; sludge removers; touch-up finishes; and allied products. Tomorrow, it will be hundreds of newer things. For information on chemicals you can use in developing this market call or write our nearest office for a copy of booklet D-8 "Synthetic Organic Chemicals."

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Chemical Industries

THE MAGAZINE OF THE CHEMICAL PROCESS INDUSTRIES

For Your Information:

Newsletter,
August, 1948.

Soap via continuous saponification is now rolling off the production line at Lever Bros.' Baltimore plant. The continuous process, developed by Sharples Corp. and Lever Bros., separates soap and glycerin by means of a series of four centrifuges, cutting down time in process from several days (by batch methods) to less than two hours.

Wyandotte Chemicals Corporation's next step in its glycol expansion program probably will be the installation of fractionating equipment to separate its glycols and oxides (CI, March 1948, p. 382). The company is now offering the mixed monoglycols, mixed diglycols, and ethylene oxide. Also under serious consideration for production in the near future are alkanolamines (ethanol and propanol), glycol ethers, and polyglycols.

In the inorganic field Wyandotte has been doing some interesting developmental work on inhibited alkalis. Used in bottle-washing and dish-washing compounds, the materials are said to virtually eliminate caustic attack on glass. The inhibitors are zinc and beryllium salts that are fused with the alkalis. Under test conditions a 3 per cent solution of inhibited alkali is said to dissolve less glass than does distilled water.

* * CI * *

Raw nylon for stockings, which sells nominally at about $2.50 per pound, is commanding a $9 premium on the free market. Trade sources attribute the shortage to diversion of nylon into other-than-hose uses and the high export demand. Two weeks ago one buyer was looking for 100,000 pounds for export over the balance of the year.

Producers of natural soda ash are being besieged by export inquiries as a result of new regulations whereby licensing procedure for the natural product has been liberalized. Manufactured soda ash is still under strict control: third-quarter quota has been set at 50,000 tons.

A paraffin that melts at body temperature is being in-

troduced by Atlantic Refining Co. Known as Ultrax 20, the material consists of predominantly straight-chain hydrocarbons averaging 20 carbon atoms per molecule. Atlantic is pushing its sales as a raw material for detergents and halogenated paraffins, and as a cosmetic and pharmaceutical vehicle.

* * CI * *

Four new organic peroxide polymerization catalysts are now being made in pilot-plant quantities by Lucidol Division of Novadel-Agene Corp. A 50 per cent solution of dibenzaldiperoxide in tricresyl phosphate is useful at temperatures above 150° C. t-Butyl permaleic acid, because it is slightly soluble in water and more soluble in alkalis, may find application in aqueous bleaching solutions and pharmaceuticals. The other two are t-butyl perphthalic acid and hydroxyheptyl peroxide.

American Maize Products Co. is now producing potassium lactate commercially. Since its water solutions exercise a close control over humidity, it is expected to find use as a glycerol substitute where a definite moisture relationship is desired.

* * CI * *

Another company has entered the permanent mothproofing field (CI, July, 1948, p. 29). Fine Organics, Inc. is introducing P.M.C. 50, a nitrogenous material which protects wool against moth damage up to 20 dry cleanings and 4 or 5 launderings.

Phosphorus-containing insecticides are gaining more and more attention. General Chemical Division is offering experimental quantities of Parathion (diethyl p-nitrophenyl thionophosphate) and Victor Chemical Works is introducing tetraethyl dithionopyrophosphate (ASP 47), an effective agent for mites, aphids, and thrips.

* * CI * *

Here and There:

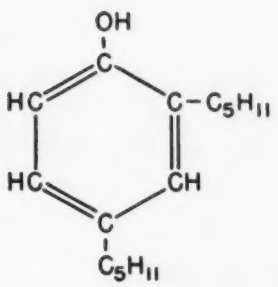
Shell Chemical Corp. expects to produce ethyl chloride at Houston...Ethane- and methanesulfonic acids, produced on pilot-plant scale by Standard Oil Co. (Indiana) for some time, are now available in commercial quantities...Sign of the times? One major chemical company has reduced the number of draftsmen in its design department by over 60 per cent -- new projects are not being approved...Television growth is expected to triple or quadruple demand for photographic chemicals for motion-picture film in five years...General Chemical Division is now making a phenol complex of the widely-used catalyst, boron trifluoride. Antimony pentafluoride is also in the pilot plant.

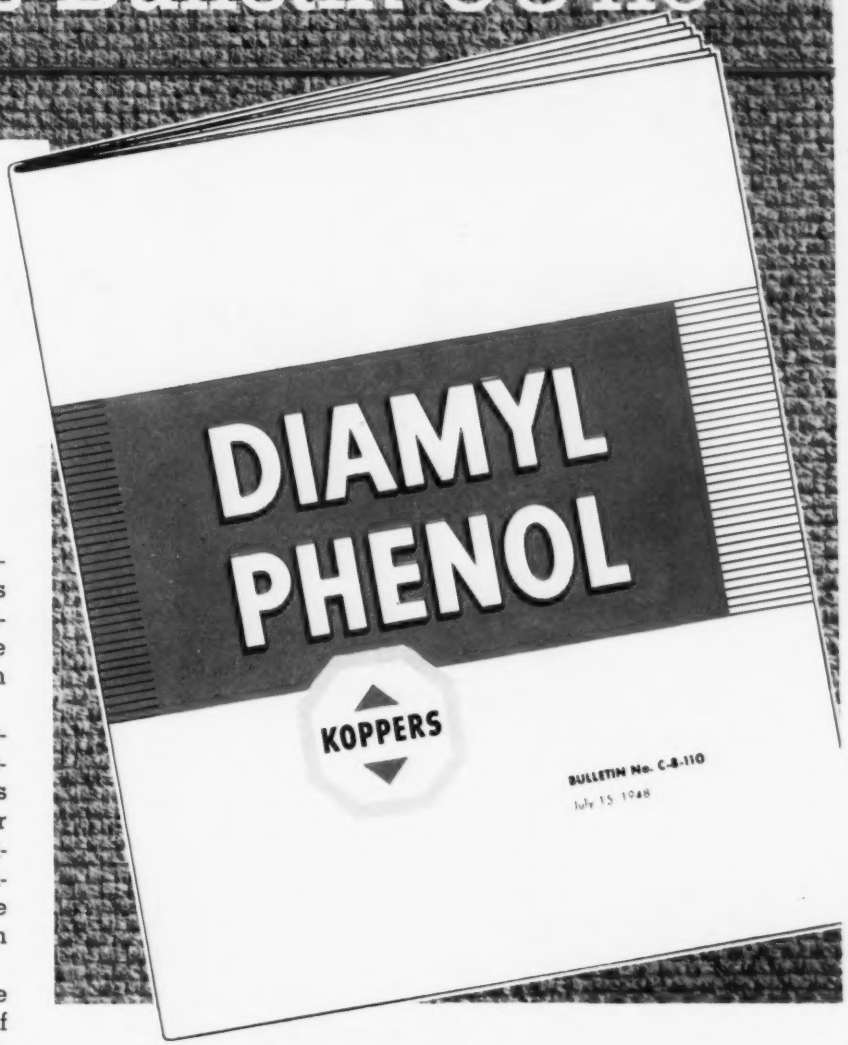
The Editors

Just out!

Diamyl Phenol

Koppers Bulletin C-8-110





THIS new 24-page booklet describes the properties, reactions and uses of Diamyl Phenol. It contains valuable information for the chemist, the plant production man and the purchasing agent.

Diamyl Phenol is a versatile organic chemical used in the production of water resistant varnishes and for special paint and lacquer formulations, additives for lubricating oils, plasticizers, and chemicals for the rubber industry. These and other uses are described in detail.

The booklet also describes the physical and chemical properties of Diamyl Phenol and includes a bibliography of 104 references relating to the chemical reactions and uses of the compound.

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MEETING THE TURN

by ROBERT L. TAYLOR, Editor

THE FIRST ARTICLE in "What's New" this month calls attention to the increasing signs that chemical supplies generally are coming into balance with demand for the first time in roughly eight years. This makes the recent sellers' market the longest in chemical history.

During these eight years chemical makers have been conditioning themselves to a set of circumstances that is totally foreign to the normal competitive nature of the chemical business. We have seen what appeared to be a limitless demand for our products. Almost any quality, service and price have been acceptable in the clamor and cry for deliveries. To the great credit of the industry it can be said that the charging of excessive prices has been limited to the small gray-market fringe. But high production almost automatically has meant high profits, and the tools of competition have been allowed to lose much of their edge.

The return to competition in itself, however, is not likely to be difficult for most chemical companies, particularly those that have built soundly and wisely during the lush years. There will doubtless be an increase in failures among the smaller and newer enterprises, but the majority of established companies will enter the period in sound financial condition and with greater reserves than at any time in their history.

What is likely to be a far more difficult and ultimately more important problem is the one of making sure that company policies and plans from this point on are attuned to the vast changes that have taken place in the country and the national economy as a result of the war. These changes have not been as forcibly brought home during the years of the sellers' market as they will be in the period to come. The return to competition will not mean simply a return to prewar methods of doing business. The chemical company management that shapes its program around the supposition that it will is courting serious trouble—of a kind that may not show up on the financial statement for quite a number of years.

What are some of the major changes that have grown out of the war and are most likely to influence the long-term course of the chemical business?

Perhaps the most striking has been the increase in total production capacity of the nation. Our ability to make things has more than doubled since 1940. Where this increase has taken place, which parts of it are based on essential needs and which on non-essential and transitory needs, what categories are most likely to expand further—all these are matters of utmost importance to makers of chemicals. Nowhere is accurate forecasting of needs more important than in the chemical industry, where high capital investment is continuously at the mercy of rapid technological change.

Income distribution has also been affected in a way that appears to be permanent to a large degree. The underprivileged part of the population has been raised to the point where it can afford more of the everyday needs of food, clothing and shelter. Some of the basic chemical markets previously thought to be tied closely to the population curve have proved that they are expandable. The great postwar growth in chemicals for agriculture is attributable substantially to the fact that farmers are enjoying higher incomes, partly through high prices for their produce but also because farming is catching up with other industries in such matters as mechanization and scientific methods.

Of only slightly less importance are geographical shifts in both consumer and industrial markets. Twenty or more years of industrial development have been telescoped into six or seven in the Far West and Southwest. Several major new consuming areas for chemicals have sprung up in these and other parts of the country, and the character and needs of older markets have changed.

It is changes like these that will affect our industry and our companies the most in the long run. They are much more important than the rise and fall of business cycles. Not only can ignorance or disregard for them be fatal, but they must be detected, evaluated and acted upon early enough to permit development of company plans that will parallel rather than trail the needs as they appear. That will be chemical management's big job in meeting the turn.

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USES

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Molecular Weight: 222.23

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Flash Point: 151.7°C. (305°F.).

Melting Point: —40.5°C.

Weight per U. S. Gallon: 9.31 pounds at 68°F.

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What's new

TWENTY OUGHT AND SIX

Though strikes have clouded the picture, production of chemicals is close to balancing demand.

MR. MICAWBER'S ADVICE on family finance to David Copperfield is analagous to the chemical supply and demand situation: "Annual income twenty pounds, annual expenditure nineteen pounds ought and six, result happiness. Annual income, twenty pounds, annual expenditure twenty pounds ought and six, result misery." There is still misery in many commodities but happiness is "ought and six" away, and has actually been realized for some with the appearance on the market of the slight bit of extra production necessary for that condition.

Both buyers and sellers can be cheered by the impending collapse of the "gray market". Several times it appeared that this postwar cancer would be conquered, but strikes both in the chemical industry and in industries supplying it with raw materials have forestalled its end. For example, the long-tight situation in caustic and chlorine was beginning to ease last spring when a strike pulled well over 10 per cent of U. S. caustic production off the line, part of it for over 2½ months. Now the main plant of another large producer is shut down.

However . . .

The difficulties in clearing the mist surrounding the true situation are illustrated by a strike that had the opposite effect on one commodity. Seasonal demand for 2,4-D and the requirements of a major producer of cellulose acetate for filling the storage tanks of a new plant were expected to provide a squeeze in acetic acid this summer. But a strike at the largest monochloracetic plant lessened the demand for acetic acid, and it is now in reasonably plentiful supply. End products, however, such as the 2,4-D removed by default and CMC, are still left short by the strike.

Shutdowns at producing plants have not been the only whipping boy. Much delay in meeting demand can be traced to continuing strikes of construction workers installing new plant capacity, particularly at Gulf Coast locations.

The recent reduction in alkyd prices is one indication of the ending gray market. This is the result of a falling off in demand which has been attributed to everything from landlord's stinginess to the wet spring. The latter, in cutting down on the amount of outside painting, may have provided the final gallon necessary to cause the swing from a sellers' to a buyers' market. A more plausible explanation is the lower state of the fats and oils market.

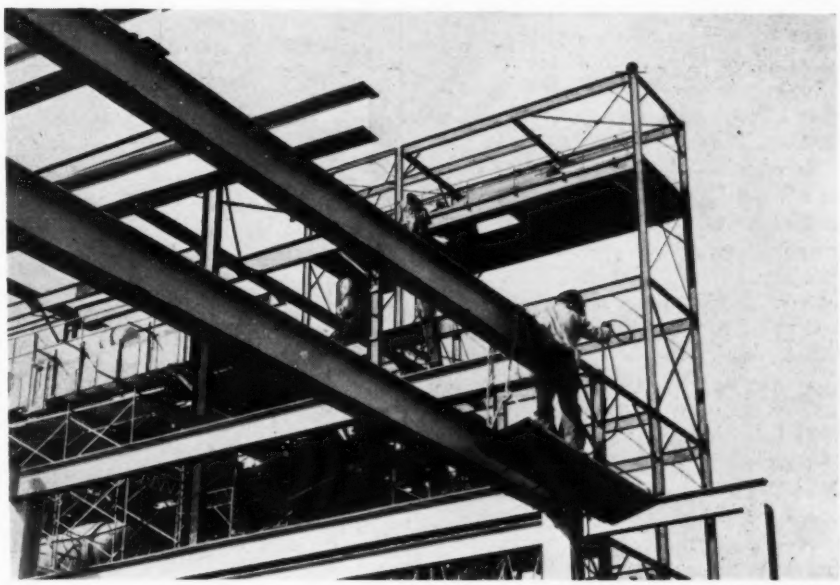
Prices Still Rising

This price reduction is not likely to be duplicated for very many commodities. Ballooning costs of raw materials, labor and freight have made a hollow whisper of one of the industry's favorite talking points — continually decreasing prices.

The vigorous young petrochemicals industry has been a major factor in bringing chemicals to postwar markets (two hundred million dollars in new capital was committed for organics in the Southwest alone—"Boom in the Southwest," CI, March 1947). However, petrochemicals have had their difficulties. With the possible exception of methane and ethane, raw materials can no longer be had at give-away prices. Even where natural gas (methane) is the desired raw material, chemical companies are faced with the necessity of buying up whole gas fields to insure continuity of supply for a sufficient time to amortize investment.

The increase in the price of crude oil is forcing refiners to leave nothing in the bottom of the oil barrel, and fewer and fewer hydrocarbons will be sold in other forms than fuel. This trend will continue since the refiners' primary job is selling energy, not chemicals.

Fifteen months ago the petroleum industry was a hopeful source of such aromatics as oxylene for phthalic anhydride (CI, May, 1947, p. 763). That this development failed to reach its promised stature is a result of the competition for crude noted above. In spite of this, in the clearing naphthalene picture can be seen greater availability of phthalic anhydride. Doubled prices have made the extraction of a greater percentage of naphthalene from coal tar worthwhile. A process of taking the naphthalene directly from the still without the usual crystallization in tanks has enabled



Shell Chemical Corp.

PLANT CONSTRUCTION: Equilibrum approaches as rivets cool.

one major company to almost double its actual recovery. Extension of such increases could, along with greater imports, solve this supply problem.

The availability of benzol is always good for argument, but there is sufficient on hand, and any decrease in styrene production or increase in coal for fuel would bring a surplus to future markets. To seriously consider supplies from petroleum at existing prices is fanciful. On the other hand, petroleum is the source of about 75 per cent of the total xylol production. Large quantities of toluol are being produced but much is going into high octane fuel (CI, July, 1948, p. 29). The recent government regulation requiring 10 per cent aromatics in aviation fuel can be expected to shorten the supply of toluol and xylol, both of which are in a fair position now.

German Exports

Another source of supply that spells happiness could well be decreased exports from the U. S. The first exports from Germany will be dyestuffs from the Casella Farbwerke of I. G., contracted for by the World Commerce Co. This particular arrangement involves only $1.5 million. Since the allied nations are anxious to cut costs of supporting Germany, it is not unreasonable to expect greater supplies from this quarter as additional capacity is activated (cf. p. 212).

Plant Expansions

Expansion of production capacity in the industry has been so great that practically all chemical companies have had to resort to new financing (CI, May, 1948, p. 749.). Most striking in these developments has been the growth of the petrochemicals industry along the Gulf Coast, although all areas of the country have contributed. Chlorine and caustic demand, for aliphatic hydrocarbon derivatives, has skyrocketed and expansions in that industry have kept pace (CI, April, 1948, p. 582).

Increased facilities as well as the strike at a major phenol plant (with consequent reduction in phenol-formaldehyde resin output) have restored methanol and formaldehyde to a position of ready availability. New units for ethylene oxide and glycol have performed a similar function for these materials.

Synthetic ethanol is a special case. The prospect of large volumes at a very low price from the new synthetic fuels plants has served to dampen early expansion plans. Higher priced ethylene has completed the dampening.

A striking new field is agricultural chemicals. The farmer, who for years was a large consumer of only fertilizers and insecticides, today buys such items as weed killers and defoliation agents, in addition to a greater volume of his old standbys. Many chemical companies have recognized the extent of this new and bigger market by establishing agricultural chemical departments. Supplying these needs is not only a highly seasonal business, but formerly, at least, purchases of such materials was almost in direct proportion to crop price levels. Reduction in the price of corn from the $2.15 per bushel level, for example, could cut this demand for crop aids.

Squeeze Play

Inflation is now outdistancing technology's ability to cut costs in the chemical industry, and prices for nearly all chemicals are still on their way up. However, producers will soon find themselves squeezed between increasing costs of production and the necessity of cutting prices in a buyers' market. Continued strikes with their complex effects have foiled attempts to catch up with excess demand, and have delayed the arrival of such a market. Expansion of production capacity has been fantastic by previous standards, and it has more than doubled 1940 capacity for ammonia, formaldehyde, acetic acid, phenol, phthalic anhydride, caustic and chlorine. It has brought the industry into near balance with the equally fantastic increase in demand.

TRIPLE PHENOL

Edwal is out to compete for dyestuffs intermediate markets with expanded phloroglucinol output.

YOU'VE got to have beta-naphthol to make beta-oxynaphthoic acid (B.O.N.), and as long as naphthol is short (CI Newsletter, July, 1948) B.O.N. is vulnerable to competitive attack. That's one good reason why Walter Guthmann, president of Edwal Laboratories, Inc., is putting in three specially-designed glass-lined vats to expand Edwal's already-expanded production of phloroglucinol (1,3,5-trihydroxybenzene).

As far as uses are concerned, phloroglucinol can't completely fill B.O.N.'s shoes. By far the major proportion of the latter material is used to make Naphthol AS and other similar large-volume dyestuffs, and here phloroglucinol is not competitive. But B.O.N. is also used as a coupling agent for fast, black acetate dyes—and phloroglucinol may become a strong contender for that sector of the business.

More Expensive—But

When Edwal first started producing small quantities of phloroglucinol in 1934, it was being imported from Germany at

CACTUS TO PHILLIPS

WHEN PHILLIPS Petroleum Co. last month leased Cactus Ordnance works, at Etter, Texas, from the Army, it had to incorporate in Texas — by state law—in order to do business there. It could have set up a corporation called Phillips Petroleum Co. of Texas, or something like that, but it chose to recognize its new status and formed instead the Phillips Chemical Co., a wholly-owned subsidiary headed up by Phillips officers.

Phillips will spend $2-3 million to double Cactus' ammonium nitrate capacity to 140,000 tons per year, $4 million for a nitrating plant, and another $5 million or more for an ammonium sulfate plant site and plant on the Houston ship channel.

The 20-year, $1 million-per-year lease stipulates that the Army has first crack at the fertilizer product. But Army needs (for export) will dwindle by 1952; and then Phillips will be virtually on its own.

What then? The company is thinking hard about anhydrous ammonia as a direct fertilizer; and other plans—still in the decision stage—may launch Phillips into formaldehyde, or alcohols, or other petrochemicals.

WALTER GUTHMANN: Bout with B.O.N.

$22 per lb. Process improvements and larger production brought the price down to $12.50 in 1941 and $10 in 1946. A "coupling grade" for the dyestuffs trade now sells for $6. Edwal's output has increased tenfold within the past year, and this further expansion is expected to drop the price below the current $6 level.

There is obviously a catch somewhere, for B.O.N. sells for $1.25 per lb. The catch is that phloroglucinol is theoretically six times as efficient. It contains twice as many molecules per lb. and each molecule has three times as many hydroxyl groups for coupling. While a sixfold efficiency is theoretically obtainable, a realization of close to fourfold is actually achieved in practice. Thus, any drop in price below $6 may have B.O.N. hanging on the ropes.

Starts With TNT

Even the recent organic textbooks say that phloroglucinol is made by caustic fusion of sodium benzene-1,3,5-trisulfonate or of resorcinol in the presence of air. Edwal uses an entirely different process: TNT is oxidized to trinitrobenzoic acid, which decarboxylates. The nitro groups are then reduced and hydrolyzed to hydroxyls, yielding phloroglucinol.

Edwal, believed to be the only large-scale producer, is now turning out well over 10 tons per month of phloroglucinol. The chemical is also used in diazo-type papers, which account for a considerable volume of the chemical; there are some minor analytical uses.

This expansion, incidentally, marks another step upwards in Edwal's evolution from a producer of small quantities of uncommon organic chemicals into a volume supplier to industry. Realization of present expectations for phloroglucinol will accelerate that Darwinian process.

"OXO-ATED" OLEFINS

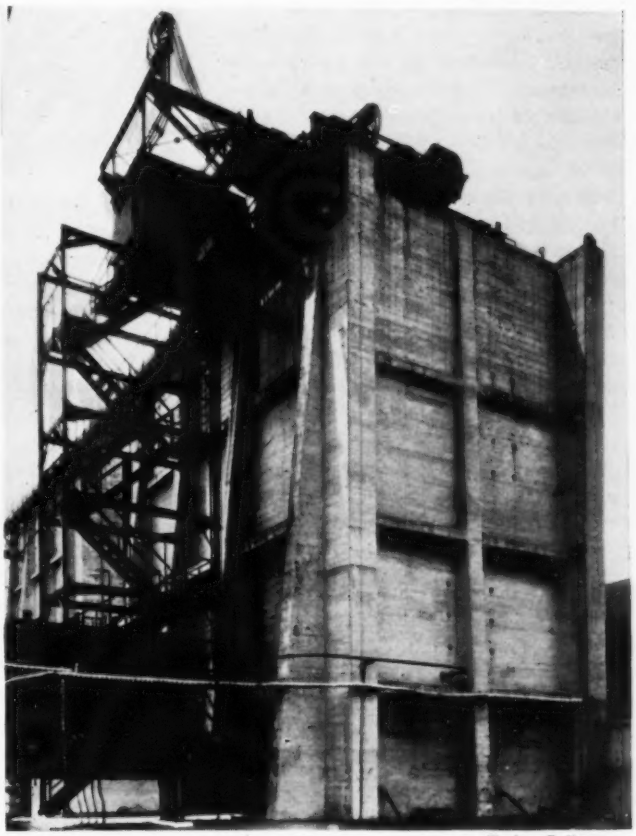
Production of alcohols and aldehydes by the action of CO and hydrogen on olefins is now a commercial reality.

THE FIRST commercial application of the well-advertised "Oxo" synthesis, the reaction of an olefin with carbon monoxide and hydrogen to extend the chain length by one carbon, is now under way, some twenty years after its discovery in the U.S. by the Bureau of Mines (CI, Feb., 1947, p. 232), and about ten years after its first application in Germany. The Esso Standard Oil Co. has modified a portion of its high-pressure petroleum hydrogenation unit at Baton Rouge, La., and is producing iso-octyl alcohol there.

Esso Standard, however, is not the only entry in the race to bring "oxo'ed" olefins to market. The Standard Oil Co. (Indiana) is planning to produce nonyl alcohol, said to be about 75 percent 3,5,5,-trimethyl-1-hexanol, by the conversion of existing high-pressure equipment at its Whiting, Ind., refinery by the fore part of 1949. Three other organizations, Oronite Chemical Co., Texas Co., and E. I. du Pont de Nemours & Co., are also interested in the production of high-molecular-weight alcohols of this nature. There is a good possibility that Du Pont will be in production by mid-fall. It is understood that Du Pont has been making inquiries for large supplies of the olefin, diisobutylene, necessary for nonyl production. The Shell group has carried on a considerable amount of experimental work on the production of alcohols and aldehydes via this process. At present it is believed to have only one "Oxo" installation planned. That is a part of its huge petrochemicals plant under construction in England.

The two types of products from this reaction can be summarized by briefly noting its mechanism. In the "Oxo" synthesis a mixture of aldehydes is produced by the direct addition of carbon monoxide and hydrogen to the double bond of the olefin molecules. This addition may take place on either carbon of the double bond, according to the early works of Roelen of Ruhrchemie, who is primarily responsible for the German development of this process. Thus a mixture is produced even if the charging stock is a pure olefin. For example, Roelen reports that equal quantities of butyraldehyde, $CH_3\ CH_2CH_2CHO$, and dimethyl acetaldehyde, $(CH_3)_2CHCHO$, are produced by the "Oxo" treatment of propylene. Production of the alcohol, as planned by the American companies, is believed to be a subsequent reaction step, although it is possible to carry out the required hydrogenation in the same reaction vessel. Other work has indicated that an increase of pressure and an increase of temperature with the original Fischer-Tropsch catalyst, cobalt-thorium oxide-magnesium oxide-kieselyuhr, results in increased yields of alcohol.

Another co-product, according to the original Roelen process (U.S.P. 2,327,-066), is the diketone, e.g., diethyl ketone from ethylene. A recent patent issued to Gresham, Brooks, and Bruner and assigned to E. I. du Pont de Nemours &



Ewing-Galloway

ESSO STANDARD'S HYDROGENATION PLANT: It's all inside.

Co. (U.S.P. 2,437,600) indicates that ketone formation may be practically eliminated when a metallic cobalt catalyst is used with sufficiently high pressures. It is of interest that the product is the aldehyde, and that alcohol formation over this catalyst is essentially nil even at the high pressure of 700 atmospheres. Secondly, with the straight-chain olefins the tendency to produced branched chains seems to be somewhat reduced, particularly if large excesses of hydrogen are used. It should be noted that all data cited in Du Pont's patent are based on quite long reaction times in batch operation.

Plasticizers

Interest in the U. S. at the present time seems to be confined almost entirely to alcohols in the C_8 and C_9 range, the aim being to provide a product competitive with the leading plasticizer alcohol, 2-ethylhexyl alcohol.

Esso Standard states that its price for iso-octyl alcohol is expected to be essentially the same as the going price for "2-ethyl hex" (somewhat under 30¢ per lb., f.o.b. producing point).

The general feeling in the vinyl field is that the dioctyl phthalate has an edge on the highly-branched dinonyl phthalate in its plasticizing properties, but nonyl alcohol can force its entry into the market on the basis of price consideration. That this is not impossible is indicated by Standard of Indiana's plans to use diisobutylene as its olefin source. For several years, manufacture of this product from isobutene has provided huge quantities of the raw material for 100-octane gasoline. It would be expected that appreciable idle plant capacity for its production is available. For the moment Esso Standard is keeping mum about its olefin source but an octyl alcohol would call for a heptylene fraction.

And Other Uses

A substantial increase in the octane number of gasoline results from the "Oxo" reaction on the double bond content of the gasoline and subsequent hydrogenation. The beneficiation is attributed to the increased branching produced by the reaction of the carbon monoxide and hydrogen with the olefin.

A major application in Germany was the production of either long-chain fatty acids via oxidation of the aldehydes or the production of long-chain alcohols, both for detergents.

Whatever the end product, the "Oxo" reaction must be utilized as a source of a group of isomers and not for the production of pure chemical impounds. Possible exceptions may be propionaldehyde, *n*-propyl alcohol and propionic acid from ethylene.

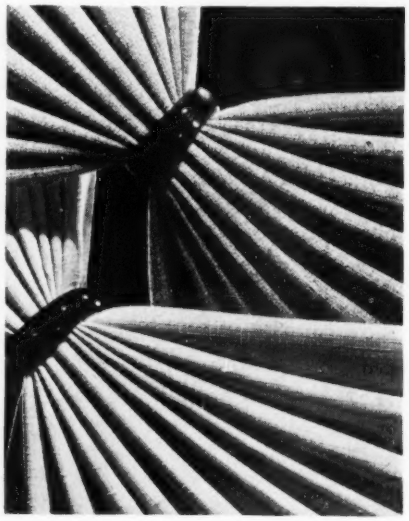
BIZONIA EXPORTS

First rayon, now dyestuffs. What next?

JOINT Export-Import Agency approval of the $1,543,330 contract between Cassella Farbwerke Mainkur in Fechenheim, Germany, and the World Commerce Corp. of New York for dyestuffs production may well mark the beginning of the large scale reentry of Germany into the world chemical markets. This is a major event.

What Has Happened

Many attempts have been made to purchase chemicals from German plants since the end of the War, but with little success, either because of the producer's inability to procure some bombed-out piece of equipment, unavailability of required raw materials, or for a variety of other reasons, generally somewhat red-tapish in nature. The Cassella-World Commerce contract is believed to mark the first time that an integated program has been presented to solve this problem.



DYED RAYON: Business for Bizonia.

World Commerce proposes to provide $475,000 in raw materials, machinery and equipment, accepting payment out of the proceeds of the resulting export production. The residue of the contract, more than $1,000,000, will be utilized by JEIA for the procurement of raw materials for Bizonia industry. It might be noted that this procurement from such funds will begin to whittle away at the huge quantity of funds that the occupying powers are now funneling into Germany at the expense of their taxpayers.

Although the only contract is between Cassella and World Commerce, it is anticipated that Cassella's need for raw materials will cause a reactivation of idle plants for the production of intermediates or an expansion of their level of operation. Thus it is hoped that such contracts will act as a catalyst for regeneration of the Bizonian economy.

Rayon Was First

World Commerce is no tyro at this type of undertaking. For example, a similar program aided resumption of rayon production in Germany, France and Italy shortly after the end of the War. The required catalyst in the case of the Italian mills, Snia-Viscosa, was coal, while Swedish pulp did the trick for France. Sale of the rayon in the United States and other countries regenerated exchange for reuse. However, not all was exported. Some was utilized for production of cloth at home. The new contract with Cassella is expected to allow for increased deliveries of dyestuffs to the German textile trade.

The dyestuff exports are expected to be primarily to the so-called "dollar-hungry" countries. The existing 45% ad valorem duty on such materials entering the United States will effectively prevent the sale of any large quantities in the United States. In any event there should be a further bleaching of the gray market which has existed in dyestuffs sold for export for some time, and possibly a reduction in the 65,000,000 lbs. exported from the U. S. in 1947.

PALESTINE PROGRESS

Resolution of the political crisis in Palestine will allow chemical expansion.

ARABS AND JEWS don't see eye to eye on very much, but both would agree that Palestinian progress depends largely on a more intensive industrialization of the contested area.

Situated smack at the crossroads of Africa, Asia, and Europe, Palestine is in a strategic position to import raw materials from and sell finished products to all three continents. It is also strategically located with regard to Middle East oil and the virtually inexhaustible mineral resources of the Dead Sea.

Hitler Helped

The first stimulus to industrialization was the completion, in the early '30s, of hydroelectric power facilities, utilizing the flow of the Jordan and Yarmuk Rivers. But even more compelling was Hitler's requirement, in 1933-1935, that emigrants to Palestine take out almost all of their capital in the form of goods rather than money. Thus the Jewish settlers

brought industrial equipment as well as technical experience into their new homeland.

Until the war, Palestine industry had to struggle for survival in the absence of protective tariffs to shelter the young projects; but the war years, cutting off trade, supplied protection and moreover jumped the demand for industrial products. As a consequence, many new enterprises – textiles, chemicals, ammunition, machinery – were founded and capital was accumulated.

Handy Raw Materials

The Palestinian chemical industry doesn't have to reach far for most of its raw materials: from Egypt it can get manganese ores, tungsten, nickel, sodium carbonate and cotton. Pyrites, asbestos, magnesite, chromium ores and locust pods are obtainable from Cyprus. (Palestine imports thousands of tons of locust pods annually to make alcohol, molasses, and feeding stock.)

The Dead Sea is estimated to contain (in billions of tons) 2 of potassium chloride, 10 of sodium chloride, 22 of magnesium chloride, 6 of calcium chloride and almost 1 of magnesium bromide. The concentration of salts is eight times that of sea water. From these salts are commercially produced potassium chloride, chlorine, bromine, potassium chlorate, table salt, potassium sulfate, magnesium chloride, caustic potash, and caustic soda.

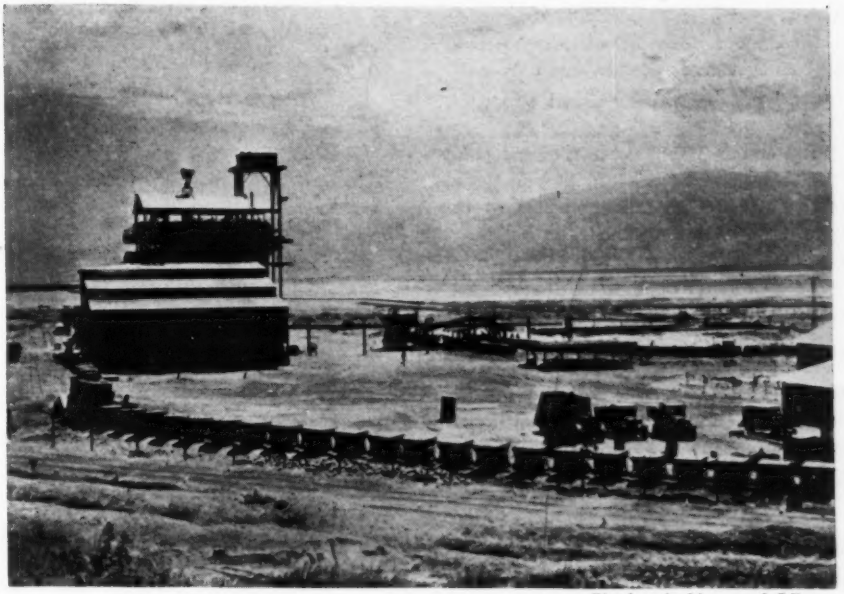
Kaolin, iodine, gypsum, sugar, and other animal and vegetable products are also available in or near Palestine. Sulfuric acid production, initiated by Consolidated Refineries, Ltd., is now carried out by several companies. The private company Taassiya Chemith started up a 15,000 tons-per-year plant late in 1947.

Until recent years the only potassium compound produced was the chloride, but now the latter is being converted into other, more valuable salts. Hydrochloric acid and sulfuric acid sludge (from oil refinining) are used to convert phosphate rock – which occurs in the Dead Sea area – into fertilizer phosphates. Taassiya Chemith produced 14,000 tons of superphosphate in 1944.

Other basic chemicals produced in the country include the following:

acetic acid	hydrochloric acid
acetone	lactic acid
acetylene	lead oxide
ethyl alcohol	methyl chloride
ammonia	nitric acid
asphalt	oxygen
butyl alcohol	potassium bichromate
carbon dioxide	potassium chlorate
chromic acid	sodium sulfide
citric acid	sulfur dioxide
gypsum	zinc chloride

These provide for the needs of various chemical process industries, such as paints and varnishes, inks, polishes, cleaning materials, textiles, laundries, tanneries, pharmaceuticals, cosmetics, metals, glass, paper mills, oils and soaps, foodstuffs, rubber, and agriculture. An example of beanstalk growth is the glass industry, whose output quadrupled between 1943 and 1946 – from 700 to over 3,000 metric tons; and a recently-completed bottle plant has a capacity almost twice as large as the total 1946 output.



Zionist Archives and Library

PALESTINE POTASH: For civilization, the concomitants.

Penicillin and Petroleum

Value of pharmaceuticals produced in Palestine rose from $80,000 in 1938 to $4,000,000 in 1945. Working in conjunction with local scientific institutions, Palestine factories are turning out prontosil, sulfaguanidine, histidine, and penicillin. Production of DDT was undertaken by several firms in 1946. The value of locally-produced cosmetics increased 14-fold from 1939 to 1942.

Several institutions, including the Hebrew University, the Industrial Research Institute at Tel Aviv, and the Federal Disposal Co., Ltd., are pushing essential oil production. At least a score of different oils are now being produced, and the ratio of present output to potential production is in most cases less than half.

Middle East oil production is now only on the threshold of world importance. It is estimated by Wallace E. Pratt, Standard Oil Co., that 30 per cent of the world's oil reserves are in that area, but up to the end of 1945 only 3.7 of the world's total oil had been produced there. (Almost 63 percent had been produced in the United States, on the other hand, which has only 16.7 per cent of the estimated total reserves.) But now the Middle East is responsible for over 10 per cent of the annual oil production.

At present, Consolidated Refineries, at Haifa, is supplied by a 12″ (45,000 bbl. per day) pipeline from the Mosul oil fields, and a parallel, 16″ (63,000 bbl. per day) line is planned. Also planned is a 20″ or 24″ (250,000-300,000 bbl.) line from the Persian Gulf fields in Saudi

Near East Chemical Demands in Excess of Production (1945)*

Commodities	*Estimated present Demand (tons/yr.)*	*Present production*	*Remarks*
Agricultural			
Nitrates and nitrogen fertilizer	550,000	none	
Superphosphate	100,000	25,000	12,000 in Palestine
Sundry fertilizers, urea, potash	15,000	potash	
Insecticides, fumigants, etc.	10,000	4,000	
Industrial and general			
Sulfuric acid	20,000	10-12,000	expanding
Caustic soda	10-15,000	3,000	
Soda ash	8-12 000	6,000	
Glucose	4,000	3,000	
Tanning extracts	6,000	?	
Aluminum sulfate	5,000	1,000	
Bleaching powder	2,000	none	
Dyestuffs	1,500-2,000	none	
Stearic acid	1,000	none	
Naphthalene	1,000	none	
Copper sulfate	500-1,000	none	
Ammonium chloride	300-500	none	

* Chemical Industries in the Near East, *The Industrial Chemist*, September, 1945.

Arabia. Refinery operations will provide a tremendous reservoir of raw material for chemical manufacture.

Tricks for Old Dogs

The accompanying table shows, by the gaps between current requirements and current production, the immediate opportunities for chemical industry in Palestine. But those figures don't tell a fraction of the story. Many of the Middle Eastern peoples have been leading a simple, static life for centuries. As civilization penetrates into the nooks and crannies of that backward area, the demand for the material concomitants of civilization — and that means chemicals — will surely grow.

The political, social, and economic impediments to progress won't be cleared away in a day, of course, but when they yield — as they will eventually — the Palestine chemical industry may well attain considerable stature.

REACTIVE LEATHER

New dialdehyde resin tannage gives a water-absorbent as well as hydrothermally-stable leather.

IN THE leather industry, a pliable, water-absorbent leather that is also hydrothermally stable (resistant to distortion when subjected to warm water) has been tantamount to having your cake and eating it, too. One of these desirable properties has always had to be obtained at the expense of the other.

Now, two well-known leather chemists, A. H. Winheim, of Planetary Chemical Co., St. Louis, Mo., and formerly chief chemist of the International Shoe Co., and E. E. Doherty, technical director of Bona Allen Inc., Buford, Ga., have brought into the commercial testing stage a new synthetic tanning process, using dialdehydes and resin-formers as the tanning agents, which they claim will accomplish this result.

No Crossing

In the early development of dialdehyde-resin tanning by these chemists, extensive molecular cross linkage occurred, resulting in a stiff, almost case-hardened, leather. The Winheim-Doherty process, according to its inventors, is now carried out in such a way as to control the degree of cross-linkage and thus yield a final product that has the texture and feel of vegetable-tanned leather.

These are the significant points: The dialdehyde process provides a true chemical linkage between the collagen of the hide and the tan. Moreover, the molecular structure of dialdehydes is such that

A. H. WINHEIM: The linkage is the thing.

under the proper conditions one aldehyde link can be made to attach itself to the hide while the other remains free to attach itself to a resin, dye, lubricant, waterproofing agent or other finishing material, thus providing a chemical bond which is said to impart physical characteristics of unusually high permanency. This is the reason for the term "reactive leather."

The inventors state that they have actually formed urea-formaldehyde and vinyl resins in the leather and have been able to build up the resin molecules to any size desired. This has permitted a wide variation in the properties of the finished leather. The work has been carried out using several of the dialdehydes, although the only one commercially available at present is glyoxal.

In Pilot Tannery

The dialdehyde process is now being tried out on a pilot plant scale in cooperation with a leading leather manufacturer. It requires no major changes in the standard tannery equipment. Results thus far, its inventors believe, indicate that it will be competitive with the vegetable tans. The chances of this probably have been helped by an increase in duty on Argentine quebracho a few months ago that was virtually equivalent to raising the base price 40 per cent. Chestnut extract, the other principal vegetable tan, has been scarce for several years because of the damaging effect of the chestnut blight on the trees.

The real significance of the process will become clearer when the results of the commercial tannery tests become available. Meanwhile the comments of several exports range from a cautious "the theory looks good" to "may revolutionize the tanning field."

CHRYSANTHEMUMMIES

Chemical fixation preserves flowers, gives rise to new specialty with many possibilities.

WHEN TWIN M.D.'s Philip and Sidney Joffe of Paterson, N. J. exhibited flowers preserved by a process discovered by themselves and their uncle, another Philip Joffe, at the International Flower Show last spring, they expected the first non-living flowers to appear there to arouse some interest. They even thought it might help to sell some of the flower preserving kits they planned to market. However, they were not prepared for the world-wide response that has piled mail in unanswerable quantities on their desks, has exhausted supplies of the kit initially offered, and has forced them in their corporate form (Jofleur, Inc.) to develop a better process just being made available in a new unit.

Curious Start

It all began with Uncle Philip's attempts to preserve manuscripts. One day, out of curiosity, he dropped a rose into the solution he was using, and found that it preserved the form, but not the color.

When he ceased work on the problem, the two brothers took over, and by 1934 were able to fix the color red. White and yellow were next conquered, but green defied their efforts until this year. The flowers resemble the original blooms in all respects but one—they have lost their fragrance. Preservation is apparently permanent—a few specimens are 19 years old.

The uncle's original process (U. S. Patent 1,935,706) involved dipping a cut flower in a melted substance, the temperature of which would not damage the flower while rapidly dehydrating it. The substance solidified rapidly at room temperature and thus preserved the form. This solid coating sublimed, was blown off, or dissolved in a solvent. Coating with a pyroxylin lacquer made the flower impervious to moisture and bacteria. Naphthalene and paradichlorobenzene were among the substances listed as having the proper physical properties for the dehydration, and the addition of a small amount of salicylic acid to this was recommended as a preservative.

A kit based on this process and the doctor's improvements, and containing enough material to preserve 2-6 dozen flowers did a brisk business at $5 each in leading department stores throughout the nation, and via mail until it was withdrawn for the new unit. The new home kit removes a serious objection to the original: the color-fixative was dissolved in a flammable alcohol into which the

flower was first immersed. Moreover, it reduces the process to two steps: dipping in a melt of form and color preservative and then in the sealing solution. The brothers have just been notified that a patent application on the new process has been approved, but they will be no more specific than to state that the rapid dehydration and color fixation is accomplished by naphthalene derivatives and that the product is protected by a methacrylate coating. The importance of the exclusion of moisture is shown by the failure of Goodrich's latex emulsion for flowers (that keeps bouquets fresh for a day) to replace their material in this step—the water reentered the structure, and decay resulted.

Manufacturing Setup

The two doctors are too busy with their patients to give much time to the avocation that has become a business. Ultra Chemical Works, Inc., has handled the manufacturing and packaging of the old kit, and will continue with the new one. "Jofleur" will be offered in two sizes ($1.98 and $4.98) by mail order and in such retail outlets as department, seed and hardware stores.

While the brothers expect their sales force to help them recoup their investment, and then some, with these home kits, they have more ambitious plans. They anticipate bulk shipments to such consumers as milliners, museums, theatrical organizations, window decorators, and agricultural stations. Another plan is to "pickle" exotic flowers in their habitat, and sell the preserved flowers to fanciers in less favored areas.

An important aspect of the process is that a diseased plant is preserved in that state. Thus more extensive study of blights may be possible. Museums are anxious to use foreign flora thus preserved to replace pictures that have had to suffice up to now. Perhaps of most significance is the extension of this process to human tissue. The brothers have a similar method which they will publish in medical journals soon. They think this will not only make available gross samples for instruction, but will cut the time for diagnoses from 3-4 days to one day.

CUSTOM CHEMICALS

New company sells services to the chemical industry.

VIC MONOSON had seen lots of companies put idle equipment to work on contract jobs during his years as an engineer in the chemical industry. He has also seen them turn down jobs when they were busy, or take them on to be squeezed in when their own schedule would permit. Companies which thought they had solved their production problems with a contract found it not renewed when the manufacturer had developed his own markets that required all his capacity all the time. Others had to forego attractive avenues of revenue because plant location did not allow certain processes, or plant equipment or design was inadequate for a particular job.

Out of these observations Monoson conceived the idea of an organization that would cater to such production problems, a company that would process other outfits' chemicals for them. The idea was still dormant when he became the production man for Manhattan Chemicals Inc., formed early this year by Herbert A. Sherman to manufacture chemicals. One of his first jobs was to help Sherman, whose previous contacts with chemicals had been in the import-export business, select a plant. An ideal location was found in Black Lick, Pa. where there was available an old steel foundry converted to paradichlorobenzene production. In the completely unrestricted location and the skeleton of a versatile plant he saw the answer to his production dream. In short order Sherman was sold, the manufacture of chemicals was shelved, and Manhattan was in the custom chemical business.

Unsound Basis?

A casual glance would indicate that Manhattan has a rough road ahead because of the very nature of its business. Batch jobs should not be hard to get, but such a market provides little security. Long-term contracts do not appear too easy to hold, for the contracting party will figure that he can make a substance cheaper himself by eliminating the service charges, and securing a better break tax-wise on plant depreciation. To retain such customers, it would seem that the processor would have to cut prices. A third obstacle these days is increased freight charges.

Manhattan does not believe the basis is unsound. It feels that a unit that can be kept in practically constant operation on a series of processes for different clients, none of whom can set up the required unit on its own premises, needs no excuses for its economic existence. Many orders for materials in amounts too small to warrant a separate plant cease to be "batch" runs. The facilities are available upon contract for increased or new production that a company may need immediately, but would have to wait otherwise for the sometimes-too-long trip from drawing board to actual production. Even if a company can modify its own equipment for a particular process occasionally necessary, it may be cheaper to let the job out than to lose the production that a shutdown, changeover, and cleanup entails.

At the Black Lick location, they can undertake any operation with practically no restrictions because of air or stream pollution or particular hazards of the

SIDNEY AND PHILIP JOFFE: A rose is a rose is a rose forever.

products involved. Companies with long established plants in areas where restrictive regulations hold, often find that a new development requires a "prohibited" process. Manhattan thinks that they will sooner come to it than try to get the laws changed.

In certain cases, the matter of freight may be an important factor. However, where the material to be processed is an expensive item, or where the savings from outside service are very great over other solutions to the problem, the percentage cost should be slight. Process in transit, wherein the material is left at the plant for processing, and then sent on to a final destination, may involve no more than extra switching charges. To partly offset shipping disadvantages that do occur, and to provide a more complete service, Manhattan plans to acquire packaging facilities in the New York metropolitan area where much of the business will be centered initially at least. Black Lick will probably handle mostly bulk shipments until then.

I. V. MONOSON: Make mine Manhattan.

How's Business?

Since the new company went into operation in April, it has been deluged with inquiries, and has been able to fill its schedules. Construction problems have been no easier on it than on more conventional organizations in the development of equipment to meet all kinds of production jobs. The set-up now permits such fundamental operations as sulfonation, recrystallization, halogenation, distillation, filtration, mixing and others. Research facilities are at present limited, but will be expanded. The company prefers to be given a process with each job, but where this is not possible, it supplies or develops the know-how too.

Typical of the type job they are doing is purification of solvent used in recrystallization of an antibiotic. The manufacturer, unable to recover the solvent at his plant, had been carting it in drums which were dumped into the lower reaches of a big river. Now they ship the drums to Black Lick, and receive back the purified solvent. Another operation is the manufacture of an intermediate, 100 pounds of which is the yield from 8,000 pounds of starting material. Manhattan has the facilities to handle this bulk material which the manufacturer, whose operations require small units, does not. He receives his 100 pounds of processed material per month and further processes it to get a final yield of 6 pounds. Another outfit with no manufacturing facilities has developed a product in its labs and has turned it over to Manhattan to manufacture for them.

A new idea should succeed if it's a good idea. From the reception of Manhattan's offer of services to the chemical industry it looks as if it has a good chance to vindicate Vic Monoson's faith in his idea, and win it that designation.

JOBS FOR "DICY"

Dicyandiamide's career is as a raw material for melamine resins, but some of its odd jobs are proving profitable.

SOMETIMES a youngster acquires an inappropriate nickname which sticks to him all his life. Such is the case with cyanoguanadine, which is only vaguely hinted at by its more familiar designation, dicyandiamide—or even more familiarly, "dicy".

And often, too, a youngster starts out on his life's career with great promise—and then surprises everyone by finding some profitable sidelines as well. "Dicy," similarly, started out simply as a raw material for melamine resins, but now American Cyanamid Co., its manufacturer, has uncovered some odd jobs which may add considerably to dicy's fame and fortunes.

Keeps It Moving

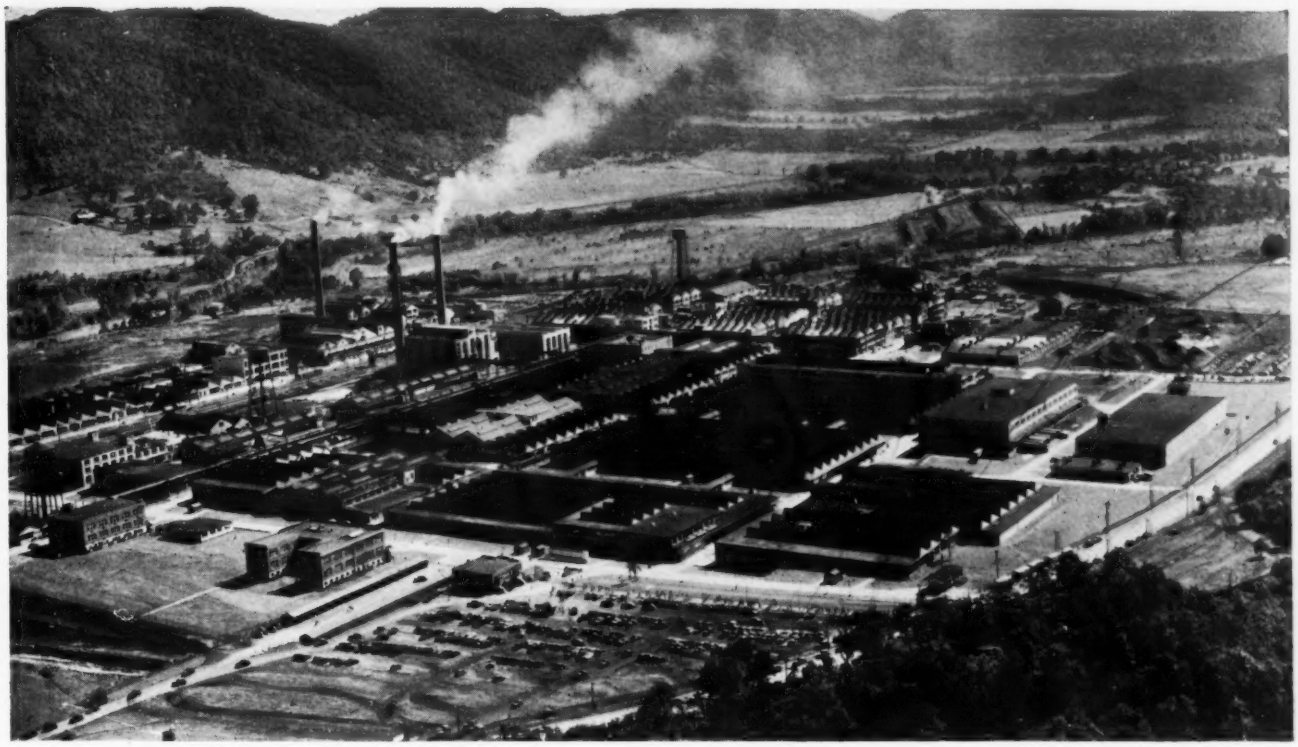
One of these jobs, which is developing into a considerable market, is to "fluidify" starch adhesives. By lowering the viscosity of the starch dispersion and keeping it low over long periods of time, dicy permits the use of a less degraded, and thus a more strongly adhesive, starch. It is more stable than urea, allowing higher cooking temperatures without foaming; and it doesn't give off unpleasant ammonia fumes. Since dicy is not hygroscopic, envelop flaps with starch-dicy adhesives don't get sticky in damp weather.

How does it work? No one really knows, but physical chemists have their theories. The widest-held one is that dicy keeps the dextrin molecules from clumping together by some mechanism of electrical repulsion. A student of electron structure can tell you, by examining the formula, $NC\text{-}NH\text{-}C(:NH)\text{-}NH_2$, that the imino hydrogen is acidic and the amino nitrogen basic. The molecule is thus a "zwitter-ion" and is enveloped by an uncommon type of electrical field.

Urea, of course, is not dicy's only competitor for fluidifying starch adhesives. The polyoxystearates (Glyco Products Co.'s Flovis and R. T. Vanderbilt Co.'s Vanesta) are widely used for the purpose. But large scale production of dicy, for melamines, has brought the price down to where it is a strong contender in this field as well. Cyanamid is already selling large quanties to adhesive-makers.

Fire and Rust

Meanwhile, Cyanamid's researchers have been putting dicy through its chemical paces, preparing a yard-long list of derivatives to learn their worth. One of them, guanylurea phosphate, $H_2NCONHC(:NH)NH_2 \cdot H_3PO_4$, looks mighty good for flameproofing fabrics, paper, and paperboard. It does not appreciably reduce the tensile strength nor affect the "hand" of treated fabrics. Guanylurea phosphate also performs commendably as a rust remover and inhibitor, and as a flameproofing component of resins. But all these uses are still in the early developmental stages.



"Acetic anhydride is inextricably tied to cellulose acetate, . . .". Cellulose acetate plant of the Celanese Corp., Cumberland, Maryland.

ACETIC ANHYDRIDE — Sevenfold in a Decade

by HERMAN W. ZABEL, Engineering Editor, Chemical Industries

ACETIC ANHYDRIDE PRODUCTION is approaching the billion pound per year rate. The story of this largest volume synthetic aliphatic chemical is practically the story of cellulose acetate, its major consumer.

THE ACETIC anhydride picture is not as simple as it seems at first glance. Since one chemical, cellulose acetate, claims most of the production, few complications would be expected. This, however is not so.

A more searching analysis uncovers a series of problems: multiplicity of raw materials and production processes, and complexities engendered by stoichiometry—one-half of the acetic anhydride reappears as acetic acid when it is used for acetylation and must be recovered.

As befits a $75,000,000-per-year product, there are many makers (Table 2) of the anhydride, only one of which, Carbide and Carbon Chemicals Corp., is not a major producer of cellulose acetate. Similarly there is only one producer of cellulose acetate, the American Viscose Co., which does not manufacture at least a portion of its anhydride requirements. Viscose also purchases a sizable percentage of the acetate flake used in its spinning operations.

CELLULOSE ACETATE

Acetic anhydride is inextricably tied to cellulose acetate, and cellulose acetate to acetate rayon and plastics (Table I).

The acetylation of cellulose requires (in round figures) 1.65 pounds of anhydride, and 2.5 pounds of glacial acetic acid per pound of acetate produced. 3.5 pounds of dilute acetic acid are produced concurrently with each pound of acetate. The accuracy of the anhydride figure is borne out by the anhydride/cellulose acetate production ratios charted in Table I. The data for 1942 and 1943 cannot be considered normal inasmuch as huge tonnages of anhydride found their way into the production of the nitration product of hexamethylene tetramine known as cyclonite. This diversion greatly increased the ratio of anhydride to acetate. Because of the low rate of production of acetate in 1938, producers probably started 1939 with very full raw-materials inventories. This accounts for that year's apparent low ratio of 1.45 pounds of anhydride per pound of cellulose acetate produced. For the other years the ratio varies between 1.675 and 1.79.

The acetate groups on each pound of cellulose acetate require a supply of approximately two pounds of acetic acid for acetic anhydride, as shown in Fig. I. For statistical purposes glacial acetic acid which enters the acetylator can be considered to be a circulating reaction medium with about half of the entering anhydride emerging as dilute acetic acid (1 pound). This dilute acetic acid is disposed of in a variety of ways but the increasingly large quantities available (about 350,000,000 lbs. last year—100% basis) has forced acetate rayon producers to develop means for its regeneration as acetic anhydride. An examination of the processes utilized for anhydride production (Table 2) indicates how this economic dictum has been carried out.

Controls for cracking acetic acid to anhydride at Tennessee Eastman, Kingsport, Tenn.

CELLULOSE ACETATE EXPANSION

The present rapid expansion of acetate rayon is expected to continue for the next two years at least. According to the statistical department of Oscar Kohorn and Co., an additional 65,000,000 pounds per year of acetate yarn capacity will be added, 60,000,000 pounds per year by the Celanese Corp. at Narrows, Va. and at Rock Hill, N. C. and 5,000,000 pounds per year by the Tennessee Eastman Corp. at Kingsport, Tenn. The American Viscose Co. at Meadville, Pa. is expected to achieve full capacity by September.

Production of cellulose acetate plastics and film appears to have reached a maximum of about 75,000,000 pounds per year and no increase can be expected. If anything, a reduction is in order because of increasingly heavy competition from polystyrene.

Acetic anhydride, as yet, has found little volume usage except in cellulose acetate. The stability of the anhydride/cellulose acetate production ratios in Table I bears out this conclusion. However, headaches, via aspirin, continue to supply a fairly sizeable market. As already noted it was used in extremely large tonnages in the production of cyclonite, where it acts as a cyclodehydrating agent.

ANHYDRIDE PRODUCTION

The processes for acetic anhydride production have been developed in cognizance of the inescapable fact that approximately one pound of acetic acid is produced per pound of cellulose acetate in cellulose acetylation along with the 2.5 pounds of acid which is diluted in the processing. In 1947 1,460,000,000 pounds of this diluted acid were recovered. Because of this, most anhydride processes must utilize acetic acid as the source of at least one of the two acetyl groups in the anhydride.

The modern era of acetic anhydride production in the United States dates from Carbide's entry into the competitive picture in 1938. Previous to that time Dow Chemical Co., except for Tennessee Eastman's relatively small production, had monopolized the field. In the '20s, Dow's anhydride came from the reaction of acetyl chloride with calcium acetate, and later, from the reaction of sodium acetate with sulfur monochloride. Eastman also utilized this latter process.

Carbide won its place in the field with cheap acetone, which was demethanated to produce ketene. Anhydride is produced by reaction of ketene with acetic acid. Its S. Charleston, W. Va. plant uses recovered acetic acid as well as new acid. Acetate producers who purchase anhydride from it are the source of the recovered acid.

Carbide's process for its latest plant at Texas City, Texas, resembles, in outline at least, that used by Shawinigan Chemicals in Canada. Carbide's acetaldehyde from ethanol is oxidized directly to acetic anhydride. Water is formed at the same time, however, and the trick is to separate the anhydride before it hydrates to acetic acid. This takes a neat bit of doing. Shawinigan first forms the greatest possible quantity of anhydride, using a very active catalyst at low reaction temperature. The water is removed by vacuum distillation without storage of the oxidation product. Vacuum allows a lower distillation temperature, which correspondingly lowers the extent of anhydride hydration.

KETENE FROM ACETIC ACID

In the most common method—utilized by Celanese and Eastman—acetic acid is dehydrated to produce ketene, $CH_2{=}C{=}O$, which then reacts with another mol of acid to produce anhydride.

Table I—Ratio of Acetic Anhydride to Cellulose Acetate

Year	*Acetic Anhydride M Pounds*	*Cellulose Acetate Rayon M Pounds*	*Cellulose Acetate Plastic M Pounds*	*Total* Cellulose Acetate M Pounds*	*Lbs. Anhydride Lbs. Acetate*
1933			2,800		
1934	67,335	38,000	—	—	—
1935	116,460	56,000	10,400	66,400	1.75
1936	136,890	66,000	—	—	—
1937	177,488	86,000	18,900	104,900	1.675
1938	114,835	80,000	—	—	—
1939	181,156	104,000	20,300	124,000	1.45
1940	na**	na	—	—	—
1941	na	181,000	—	—	—
1942	430,364	195,000	10,000	205,000	2.24
1943	460,425	195,000	36,000	231,000	2.00
1944	493,654	212,000	65,000	277,000	1.78
1945	524,748	214,000	na	—	—
1946	521,911	230,000	est. 76,000	306,000	1.7
1947	623,131	282,000	est. 57,000	339,000	1.84
1948	est. 750,000	est. 360,000			

Source: U. S. Tariff Commission
* Rayon Organon
** Not Available

Table 2—Manufacturers of Acetic Anhydride

Company	*Location*	*Process Used*
Carbide and Carbon Chemicals Corp.	Whiting, Ind. Texas City, Texas S. Charleston, W. Va.	$CH_3COCH_3 \rightarrow CH_4 + CH_2{=}C{=}O$ (1) $CH_2{=}C{=}O + CH_3COOH \rightarrow (CH_3CO)_2O$ (2) $2CH_3CHO + O_2 \rightarrow (CH_3CO)_2O + H_2O$ Both of above utilized.
Celanese Corp.	Narrows, Va. Amcelle, Md.	$2CH_3COOH \rightarrow (CH_3CO)_2O + H_2O$
E. I. duPont de Nemours & Co.	Waynesboro, Va.	$C_2H_2 + 2CH_3COOH \rightarrow CH_3CH(OOCCH_3)_2$ (1) $CH_3CH(OOCCH_3)_2 \rightarrow CH_3CHO + (CH_3CO)_2O$ (2)
	LaPorte, Texas	$CH_3COCH_3 \rightarrow CH_4 + CH_2{=}C{=}O$ (1) $CH_2{=}C{=}O + CH_3COOH \rightarrow (CH_3CO)_2O$ (2)
Hercules Powder Co.	Parlin, N. J.	do.
Tennessee Eastman Corp.	Kingsport, Tenn.	$2CH_3COOH \rightarrow (CH_3CO)_2O + H_2O$

Ethanol purchased from the Esso Standard Oil Co. is Eastman's source of "new" acid for its plant at Kingsport. Output of that unit is believed to be about 170,000,000 pounds of anhydride per year, the company's total requirements. The ethanol is dehydrogenated to acetaldehyde, which is then oxidized to acetic acid preparatory to charging to the dehydration units.

Celanese purchases some anhydride but produces the greater portion from its recovered acid and new acid from its new hydrocarbon oxidation plant at Chemcel, Texas (CI, May, 1948, p. 738).

Du Pont is believed to purchase some anhydride, although it has two plants in operation—one at Waynesboro, Va. and another at La Porte, Texas. The plant at Waynesboro (in operation for some time) utilizes calcium-carbide acetylene from Air Reduction's nearby plant at Ivanhoe, Va. The acetylene is reacted with acetic acid to yield ethylidene diacetate, which upon heating decomposes into acetic anhydride and acetaldehyde. The acetaldehyde is presumably oxidized to acetic acid, which is fed back into the process. About 15% of the original acetylene forms vinyl acetate as a side reaction. The latter is separated and sold.

Table 3—Acetic Acid

Year	Synthetic M Pounds	Recovered M Pounds
1933	65,000	—
1934	—	—
1935	101,500	—
1936	—	—
1937	131,600	—
1938	—	—
1939	—	—
1940	186,000	—
1941	226,000	—
1942	237,000	568,000
1943	293,000	510,000
1944	293,000	1,000,000
1945	268,000	1,000,000
1946	285,000	—
1947	360,000	1,459,000
1948	est. 400,000	est. 1,647,000

Table 4—Cellulose Acetate Plants*
January 1, 1948

Company	Location	Estimated Capacity Pounds Year
American Viscose Co.	Meadville, Pa.	35,000,000
Celanese Corp.	Amcelle, Md.	
Celanese Corp.	Celco, Va.	
Celanese Corp.	Rome, Ga.	175,000,000
E. I. du Pont de Nemours & Co.	Waynesboro, Va.	30,000,000
Hercules Powder Co.	Parlin, N. J.	35,000,000
Tennessee Eastman Corp.	Kingsport, Tenn.	100,000,000
	Total	375,000,000

* Includes capacity for rayon and plastics
Rayon = 310,000,000 pounds/year. Plastics = 65,000,000 pounds/year.

ACETIC ACID

Acetic acid production (Table 3) figures prominently in the anhydride picture as the source of over half of that material. Today most of the production of U. S. Industrial Chemicals, Inc., Publicker Industries, Inc., and Commercial Solvents Corp. goes into ester production for solvents. These companies produce acid by oxidation of fermentation ethanol.

Carbide and Carbon, which oxidizes synthetic ethanol to produce acetic acid, combines with Niacet to make the Union Carbide and Carbon Corp. the largest marketer of acetic acid. Niacet hydrates acetylene to produce acetaldehyde which is oxidized to acetic acid.

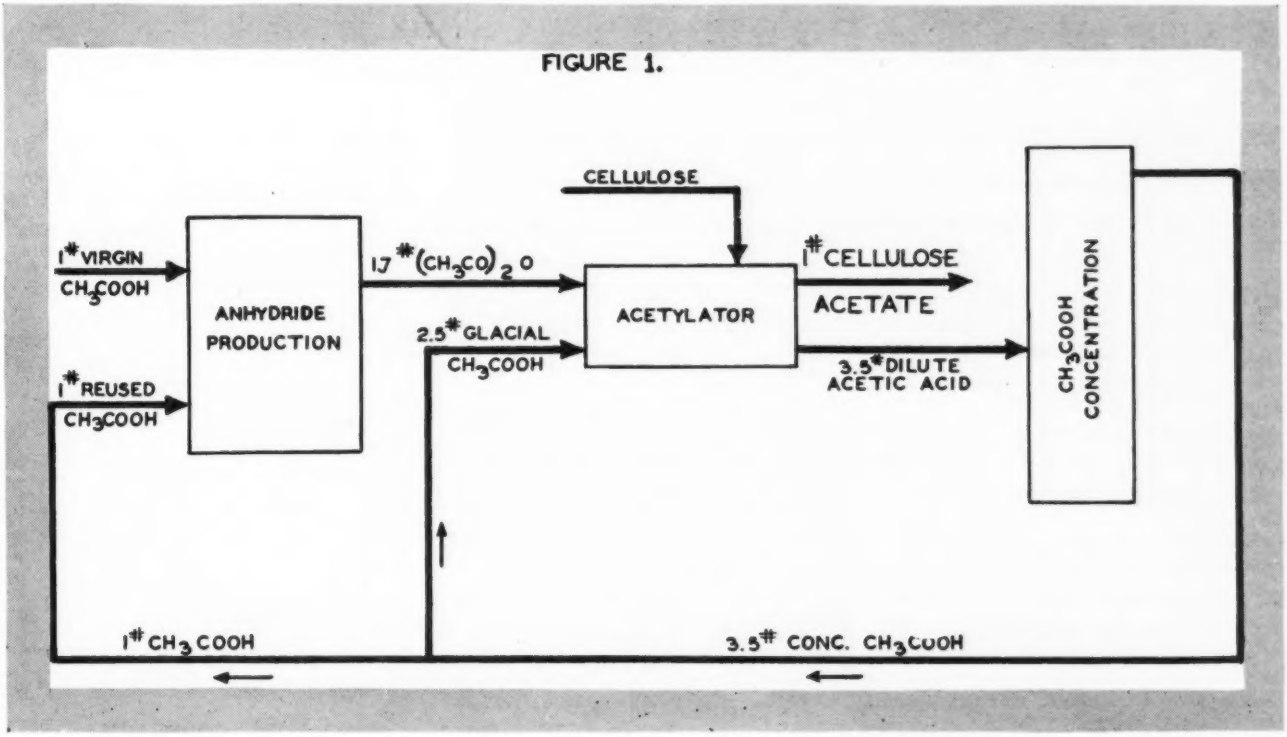
At Chemcel, Texas, Celanese oxidizes C_3-C_4 hydrocarbons to produce acetaldehyde for oxidation to acetic acid. Most of it is eventually converted to acetic anhydride for production of acetate rayon. Du Pont produces acetic acid at Belle, W. Va., by the addition of carbon monoxide to methanol under high pressure, while Tennessee Eastman's product, as noted before, comes from synthetic ethanol. Most of the production of this group of companies goes into acetic anhydride for their own use.

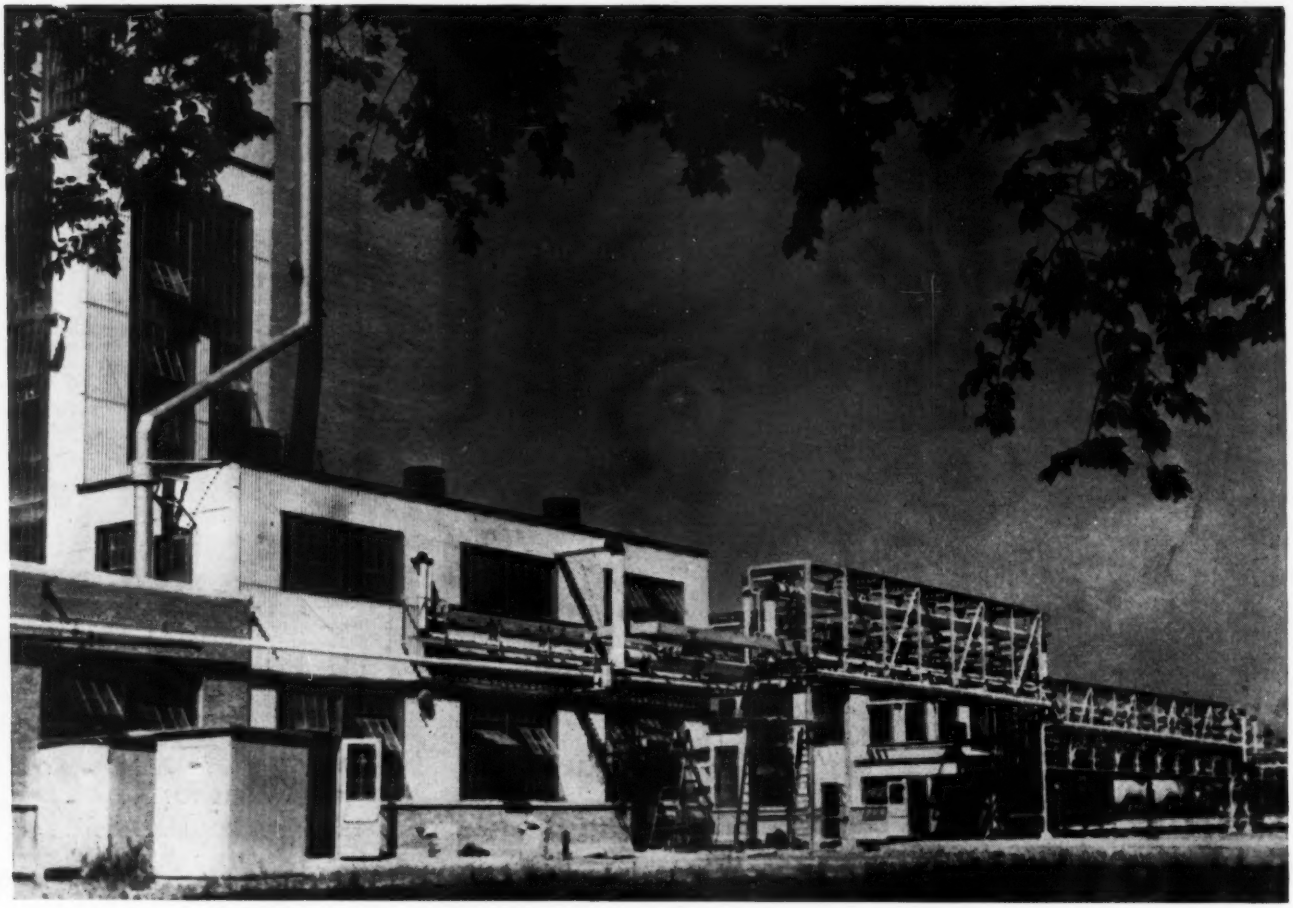
All cellulose acetate producers operate large acetic acid recovery plants as do the aspirin producers—Dow, Monsanto, Bayer and Heyden. Statistics for the acetic acid industry of 1947: 360,000,000 pounds of virgin acid and 1,500,000,000 pounds of recovered acid.

WHERE TO?

A prediction of anhydride's future first requires a peek at the prospects of cellulose acetate. No increase in plant capacity can be expected beyond that available upon completion of the American Viscose's Meadville expansion, the small expansion of Eastman, and the Celanese expansions at Narrows, Va., and at Rock Hill, S. C. Capacity for anhydride by 1949 should approach 850,000,000 pounds per year.

FIGURE 1.





GENERAL ELECTRIC Completes Full-Scale SILICONE PLANT

EDITORIAL STAFF REPORT

THE MULTI-MILLION DOLLAR SILICONE PLANT recently completed by General Electric Co. at Waterford, N. Y., provides additional capacity to parallel growing demand for these materials.

STILL another rung on the ladder was gained by the silicones in their climb towards commercial importance when completion of General Electric Co.'s new plant at Waterford, N. Y., was formally announced a few weeks ago.

TEN-YEAR PROJECT

The plant has been operating on a limited scale for about a year, but it is now turning out silicone oils, greases, resins, rubber and water-repellent materials at full capacity. Consisting of six buildings and a tank farm located on a 15-acre plot, it currently employs about 150 workers.

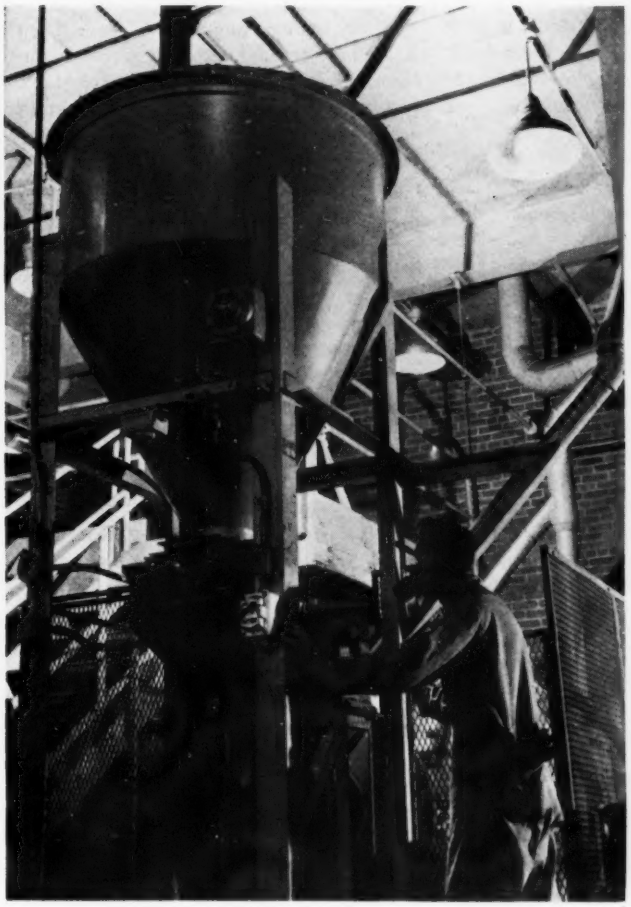
The new plant is the fructification of a decade-long cultivation of silicone chemistry. General Electric became interested in the silicones in the late '30s, when it was looking for electrical insulation materials which would stand up under heat. Research was initiated under W. I. Patnode and later carried forward by Eugene Rochow. During the war G-E operated a semi-commercial pilot plant, making silicone materials for military purposes; and shortly thereafter plans took shape for the present, full-scale plant at Waterford.

Meanwhile, Corning Glass Works was looking for a laminating material to use with glass insulation. Silicones—familiar to them through Kipping's early researches—looked like the answer. Since Kipping's Grignard-reaction mode of preparation involves large quantities of magnesium as an essential reagent, it was logical that Corning should team up with Dow Chemical Co.—the two of them forming Dow-Corning Corporation—to exploit the Grignard synthesis of silicones.

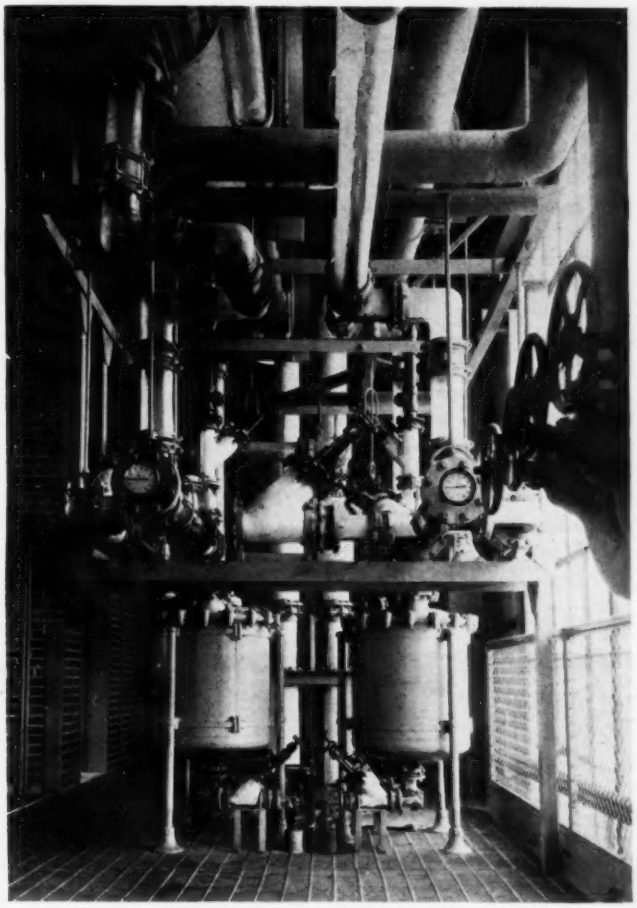
In this synthesis methyl (or some other alkyl or aryl) chloride reacts with magnesium to form the Grignard reagent, RMgCl. This reacts in turn with silicon tetrachloride to give the various silicon chlorides:

$$RMgCl + SiCl_4 \rightarrow RSiCl_3 + MgCl_2$$
$$2RMgCl + SiCl_4 \rightarrow R_2SiCl_2 + 2MgCl_2$$
$$3RMgCl + SiCl_4 \rightarrow R_3SiCl + 3MgCl_2$$

General Electric has not disclosed how



Operator is about to reduce material in ball mill.



Reaction kettles in hydrolysis building.

it is making silicones, but it is reasonable to assume that it is utilizing the relatively recent patents assigned to it by Rochow [1-5].

DIRECT PROCESS

As described in these patents, elemental silicon reacts directly—usually in the presence of a catalyst—with alkyl or aryl halides to give the corresponding silicon chlorides:

$$2RCl + Si \rightarrow R_2SiCl_2$$

Some disproportionation apparently occurs, for the other products, $RSiCl_3$ and R_3SiCl, as well as some in which R is replaced by H, are also found in the reaction mixture.

The patents also indicate some of the conditions under which the reaction proceeds. Silicon alone can be used, in powdered or porous solid form, but better results are obtained if a catalyst is admixed. Copper, in the proportion of 10 to 20 per cent, is generally used for alkyl chlorides,[1] while silver is preferable for aryl chlorides [6]. In the reaction of chlorobenzene with silicon a 90:10 silicon-silver mixture, reacting at 400° C., is better than a 50:50 silicon-copper mixture. Nickel, antimony, or platinum are without catalytic effect on the cited reaction; but the former two, as well as silver, tin, manganese, and titanium catalyze silicon-alkyl chloride reactions.

In one patent [2] a 90:10 silicon-copper mixture is molded into pellets or friable bars which are fired at 1050° C. under a hydrogen atmosphere and used at a reaction temperature of 250°-400° C. In another patent [5] a 50:50 mixture is heated for 20 hours at 155° C., at which point it is friable. It is then oxidized by an air stream at 50°-270° for 21 hours, whereafter it is used at a reaction temperature of 420° C. Five times greater effectiveness is claimed for the oxidized catalyst than for the unoxidized alloy.

Dilution of alkyl chloride vapor with nitrogen improves the yield.[4]

Power house, reactor building, and machine shop at Waterford plant.

HYDROLYSIS

The individual silicon chlorides are hydrolyzed by dilute acid to the corresponding hydroxyl compounds, which are capable of forming polymers by intermolecular condensation. Dialkyldichlorosilane hydrolyzes to form, presumably, a dihydroxy derivative which splits out water (analogous to ether formation from glycols) to form a long chain:

$$-SiR_2-O-SiR_2-O-SiR_2-\text{etc.}$$

If these chains are very long, the re-

sulting material is a soft resin susceptible to "vulcanization" by peroxides to rubber. If the chains are terminated at somewhat shorter lengths by "chain stoppers," then the physical properties are those of an oil. Trialkylchlorosilane is a chain stopper since it is unifunctional; i.e., it hydrolyzes and reacts to form an -O-SiR_3 group, which has no additional hydroxyl group to continue the chain.

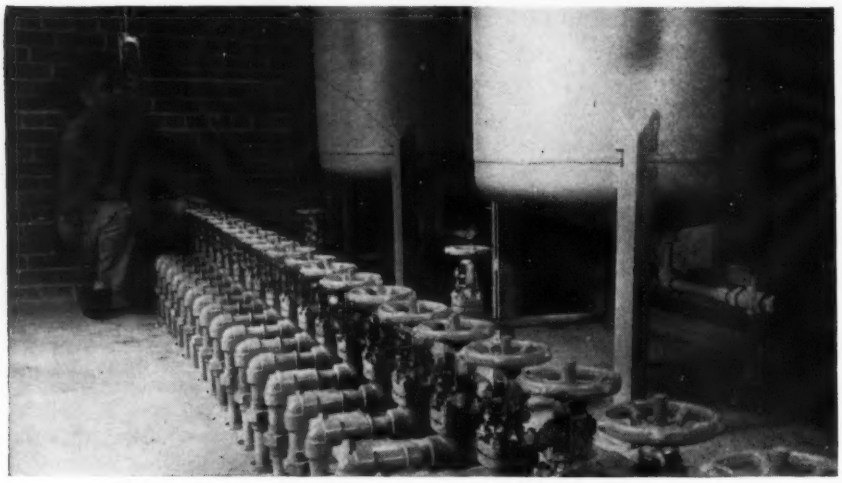
Alkyltrichlorosilane, because it has three functional groups after hydrolysis, is a cross-linking agent. Its effect may be compared to that of glycerin in alkyd-resin formation. Incorporation of this intermediate in the hydrolysis mixture results in hard resins; and small quantities improve the low-temperature properties of oils.

Another Rochow patent[7] describes the use of dehydrating agents to speed resin formation. If an alkyl silicon chloride is mixed with half its volume of ethyl borate and hydrolyzed at 190° C., a solid polymer is formed in 10 minutes; but in the absence of the borate, several hours are required for the same result.

NEW USES DEVELOPED

While research on fundamental silicone chemistry and methods of manufacture has been progressing, applied research on the uses of the materials has also been pressing forward.

Blending of silicone resins with the conventional resins used in paints, lacquers, and enamels is claimed to impart desirable qualities to those formulations. It eliminates pigment floating or streaking in paints containing more than one pigment; reduces "orange peel" in sprayed lacquers and enamels; and prevents foaming of water paints. The silicones also improve heat resistance of the coatings.



These valves control processing in distillation building.

Raw materials and intermediates are stored at tank farm.

Some coating formulations have been devised in which silicone resins predominate. Baking temperatures have been brought down to practical levels by resin design and catalysis so that curing proceeds rapidly above 175° C. Average curing time at 350° F. is an hour; at 500° F., 10 to 15 minutes.

One of the newer uses of silicone oil is as a mold release agent in injection molding of aluminum and zinc die castings. It has already found wide use as a lubricant in the molding of rubber and plastics. Silicone oil is also used as an anti-foaming agent, hydraulic fluid, damping fluid, and liquid for constant-temperature baths.

Silicone films have found application as water repellents for such diverse products as ceramic insulators, fluorescent lamps, electronic organs, and fishermen's flies. Now under investigation is their use on concrete walls, floors, and similar surfaces.

PUTTY GOLF BALLS

The peculiar, "neither-fish-nor-fowl" product that is neither rubber nor plastic but simply "bouncing putty" was nothing but a curiosity for three years. Now it has found a use as the center material for U. S. Rubber Co.'s golf balls. Other minor uses have been exploited, but this is the first one that will use substantial amount of the silicone putty. (A manufacturer has just come out with a device, incorporating the putty, which automatically adjusts table-leg lengths to unevenness of floors.)

Silicone rubber found its initial application as a gasket material for searchlights and other war uses. Such gaskets have been found useful for jet and Diesel engines, chemical reactor vessels, and on other equipment operating at higher-than-ordinary temperatures. Packings and valve seats of silicone rubber have proved successful. Recent developments include silicone rubber-coated wire, cable, and glass cloth. A new silicone adhesive joins the rubber to itself, metals, or ceramics; and it also bonds glass to glass, glass to metals, and metals to metals.

Cost of the silicone materials is prohibitively high for all but specialty uses. It is logical to assume, however, that process improvements and large-scale output will eventually drop the price to the point where markets can be further widened. It has happened countless times with other new chemical products, and the Waterford plant is a characteristic landmark along that familiar road.

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2. U. S. Patent No. 2,380,996.
3. U. S. Patent No. 2,380,998.
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6. *J. Am. Chem. Soc.* 67, 1772-4 (1945).

A CI REPORT ON

SYNTHETIC CHEMICALS FOR AGRICULTURE

Part 2: Fungicides, Nematocides, Rodenticides and Weed Killers

by R. H. WELLMAN*

AN ESTIMATED 120 MILLION POUNDS of fungicides were used in the United States on two crops alone last year. Weed killers and nematocides too, are becoming multi-million dollar businesses through replacement of hand cultivation. But there are still many gaps — and opportunities — in the field of agricultural chemicals.

FUNGICIDES

THE ten most important fungus diseases of plants caused an estimated average annual loss of 340 million dollars during the 1930's in spite of the control measures then practiced. Figures for the current decade are not available, but it is reasonable to assume that this figure would be doubled since crop values have doubled.

Fungi are plants that cannot synthesize their own nutrient since they are devoid of chlorophyll and hence must depend on food synthesized by other living organisms. We shall be concerned here primarily with those fungi that are parasitic on plants.

Fungicides are usually used to prevent a plant from becoming infected. This may be done by spraying the foliage or fruit before conditions are suitable for infection. Examples of this approach are the spraying of apples for scab control and potatoes for late blight. In both instances an attempt is made to have a protective covering of chemical on the plant during the entire growing season. Since sprays must be applied at from three to fourteen day intervals, it is easy to understand why an estimated 120 million pounds of fungicide were used in continental United States during 1947 for the control of these two diseases alone. Eradicant sprays where the fungus is killed by "burning out" the infected areas have found use in the control of apple scab. The extension of their use to other diseases is handicapped by the difficulty of finding materials that will kill the fungus in the infected area without injuring the surrounding healthy host tissue. Another manner of protecting crop plants from fungus infection is treating the seed either to kill fungi already on the seeds or so protect the seed from soil fungi.

There are fungi for which no economically effective fungicide exists, but as new materials are added to our armamentarium the list grows smaller. There are certain soil fungi, such as the wilt and root-rot organisms, that have not yet been successfully controlled by any fungicides at any cost. A soil fungicide controlling such organisms might be one of the important developments of the future. Another promising approach in controlling fungi for which there are no known control methods that is still in the experimental stage is internal therapy. Just as penicillin and the sufa drugs are capable of killing bacteria in human hosts, so it is hoped that chemicals will be found that will penetrate into a plant and kill the invading fungi.

Ten years ago the fungicide field was almost entirely confined to the copper and sulfur fungicides with calcium cyanamide and the dinitro-*o*-cresylates just developing as soil treatments or ground sprays. The organic mercury compounds and formaldehyde were used for seed treatments. The chlorinated phenols were being developed as wood preservatives.

Now there are a host of new fungicides either on the market or in the development stage. In a series of cooperative tests recently conducted under the auspices of the American Phytopathological Society, at least thirty of the materials tried were unknown as fungicides ten years ago. Most of these new fungicides fall into one of the following eight chemical classifications: dithiocarbamates, chlorinated quinones, chlorophenates, glyoxalidine derivatives, quaternary ammonium compounds, quinoline derivatives, chromate complexes, and organic mercury compounds.

DITHIOCARBAMATES

These compounds are made by reaction

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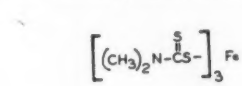
of carbon disulfide with an amine to form a dithiocarbamic acid. The acid in turn is reacted with a metal hydroxide to form a stable salt. For example, the preparation of the sodium salt of ethylene bisdithiocarbamic acid from ethylenediamine can be pictured as follows:

$$H_2NCH_2CH_2NH_2 + CS_2 \rightarrow$$
$$HSCSNHCH_2CH_2NHCSSH +$$
$$NaOH \rightarrow$$
$$NaSCSNHCH_2CH_2NHCSSNa$$

The dithiocarbamates are probably the most widely used of the new fungicides. Ferric dimethyldithiocarbamate is the



oldest from the commercial usage standpoint. It was found to be extremely effective in controlling apple rust. In fact one pound of this compound per 100 gallons of spray is more effective than ten pounds of wettable sulfur. It is not effective for control of apple and pear scab but is finding applications on other fruit crops and on ornamentals. It has not been widely used on vegetable crops except for the anthracnose disease types. It is efficient for control of blue mold in tobacco seedbeds.

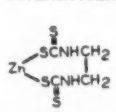
Westvaco Chlorine Products Corp.

Carrot crop. The left hand portion of this field has been treated with Soilfume 60-40, an ethylene dibromide fumigant. The area at the right was seeded, but not treated.

Zinc dimethyldithiocarbamate has

shown particular effectiveness on the anthracnose diseases. On tomato its use in a spray schedule alternating with copper materials is recommended in some states. It has been shown to be effective against early but not late blight of potato.

A possible structural representation of zinc ethylene bisdithiocarbamate is:



This probably is too simple a structure since cross linking by zinc of two or more dithiocarbamates or the formation of large rings containing two or more zinc atoms is possible.

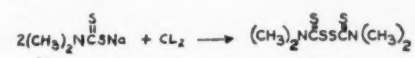
The sodium salt of ethylene bisdithiocarbamate is used with zinc sulfate and lime. In the spray tank these three components probably react to form the zinc salt. Thus, the zinc salt is either prepared as a reaction product from the sodium salt in the tank or supplied directly. Various workers have claimed differences in the performance of these two products, but in this general discussion we will treat them as similar materials.

These materials have been used successfully on potatoes to combat blight and are now finding a place in the control of other vegetable diseases such as celery blights. In general, on potatoes, best results have been obtained where the interval between sprays has been shorter than that used for copper sprays. Unlike Bordeaux Mixture these materials do not depress yields where disease is not a factor. In fact claims for stimulation have been made, but more adequate experimentation is necessary before these claims can be substantiated.

The manganese ethylene bisdithiocarbamate and a zinc dimethyldithiocarbamate cyclohexylamine complex are receiving considerable attention among experimenters, but have not yet been widely introduced into commerce.

One of the clearest illustrations of relation of chemical structure to fungicidal action is provided by the dithiocarbamate series. It is known that the smaller the organic portion of these compounds the greater their fungicidal effectiveness. Thus, the ethyl derivatives are less potent than the methyl derivatives, and the propyl derivatives are practically ineffective. In laboratory tests the dithiocarbamates made from dimethylamine are over a thousand times more effective than those made from dibutylamine. The dithiocarbamates made from ethylenediamine are even more potent in the laboratory perhaps because the organic portion constitutes a still smaller fraction of the total.

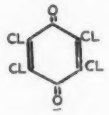
Tetramethylthiuram disulfide is a chemical relative of the dithiocarbamates and can be made in accordance with the following reaction:



It is being widely used as a seed treatment, particularly for corn, and for some vegetable seeds. When used as a dust it caused considerable irritation to the operators in the treating operation, but a slurry method of treating seed has been devised that overcomes this objection. This fungicide is also used in controlling certain diseases of turf, particularly large brown patch.

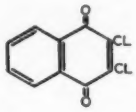
CHLORINATED QUINONES

Two members of this series have been introduced to the trade. The first was tetrachlorobenzoquinone, or chloranil:



It has been particularly effective for the treatment of leguminous seeds and is also useful for the control of spinach and cabbage downy mildew.

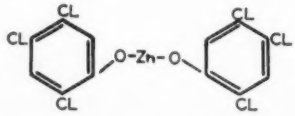
2,3-Dichloro-1,4-naphthoquinone has the formula:



It has been consistently one of the most effective of the new materials in the control of fungus diseases. In many cases, its margin of safety between effective dosage and that giving plant injury is narrow, so that injury to many crops, sometimes resulting in yield reduction, has been reported. Unless this compound can be made safer by an adjuvant its use will be limited to those crops where the margin of safety appears to be greatest, such as roses. It is also finding use as a seed treatment, especially on sugar beets.

CHLOROPHENATES

The chlorophenates are not new materials in the field of wood preservation, where sodium pentachlorophenate has been used for years. Their use against diseases of plants has been much more recent. Zinc trichlorophenate and a compound closely related to the chlorophenates, 2,4,5-trichlorophenyl acetate, have been found to be especially effective for use on cotton seed.



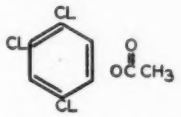
Zinc trichlorophenate

Approximately 30 million acres are

American Cyanamid Co.

Aero Cyanamid, special grade, applied when cotton crop is "made" assures early opening of bolls so stripping can be started well ahead of frost.

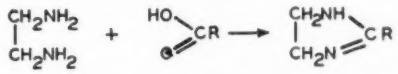
planted to cotton each year, and it takes a bushel of cotton seed to plant an acre. At an application rate of 2 oz. of chemical per bushel, this one use provides a potential annual market of 3.8 million pounds of fungicide.



2,4,5-Trichlorophenyl acetate

GLYOXALIDINE DERIVATIVES

The glyoxalidine or imidazoline derivatives may be made by reacting the appropriate acid with ethylenediamine:



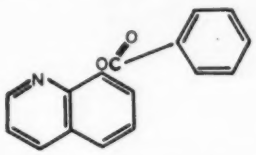
The most important member of the family, so far (is 2-heptadecylglyxalidine. It has been especially successful for the control of cherry leaf spot, and, now that formulation difficulties appear solved, is doing an excellent job in controlling apple scab. Properly formulated, it avoids the shock to the foliage that sometimes follows sulfur sprays, particularly lime-sulfur.

QUATERNARY AMMONIUM COMPOUNDS

The quaternary ammonium compounds are being widely used as bactericides in the food industry and it is very logical that attempts should be made to develop them as fungicides also. In general, they have not been too promising as foliage fungicides unless they have contained, in addition to the quaternary ammonium radical, a metal such as mercury or cadmium which in itself is fungicidal. The organo-metallic members of this group will be discussed later with the other organo-metallic representatives.

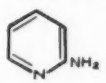
QUINOLINE DERIVATIVES

The bactericidal and spermaticidal properties of certain quinoline derivatives have been well established. 8-Hydroxyquinoline and its salts and esters have



recently shown promise in disease control. 8-Hydroxyquinoline benzoate has been shown to be an antidote for the toxin produced by the fungus causing Dutch elm disease. Thus, its use does delay the appearance of the symptoms of disease. This is one of the approaches that those interested in chemotherapeutic treatment of plants are pursuing.

Copper 8-hydroxyquinolinolate has shown promise on certain fruit and vegetable diseases, though its effectiveness on the latter should be substantiated by further testing. Its principle handicap, so far, has been its high cost and the lack of available quinoline for large scale production. 2-Aminopyridine, a cyclic nitro-



gen compound related to the quinoline series, has shown promise for the control of stem-end rot of citrus.

CHROMATE COMPLEXES

The chromate complexes are inorganic compounds that properly belong in this discussion since they are new synthetic compounds. They are introduced also to show that new developments in the inorganic fields are still occurring.

Chromium compounds have been used for wood preservation for some years but the simple compounds previously known were either so soluble that they injured plants or so insoluble that they were ineffective fungicides. The materials effective as foliage fungicides are Berthollides having distinctive X-ray diffraction patterns. The copper zinc chromate complex with the empirical formula $15CuO \cdot 10ZnO \cdot 6CrO_3 \cdot 25H_2O$ has given good control of late blight of potatoes and exceptional control of early blight with attendant high yields. The copper compounds now on the market are not effective in controlling early blight.

Another chromate complex having the empirical formula $6CdO \cdot 100CaO \cdot 25CuO \cdot 10ZnO \cdot 25SO_3 \cdot 10CrO_3 \cdot 170H_2O$ is being used very successfully to control dollar spot of turf.

ORGANIC MERCURY COMPOUNDS

The organic mercury compounds were among the first organic fungicides to be developed. Their principal use has been for seed treatment where the trade has long been familiar with ethyl mercuric chloride, ethyl mercuric phosphate, phenyl mercuric cyanamide, and hydroxymercurichlorophenol. During the early part of the last decade these materials captured the major share of the seed treatment market from the older materials, such as copper carbonate and formaldehyde. Today, they in turn are being dislodged from certain of their uses by newer materials. New organic mercury compounds, however, are also entering this field. Ethyl mercury p-toluene sulfonanilide,

phenyl mercuric urea, and phenyl mercuric acetate are finding uses as seed and bulb treatments.

Recently, other organic mercury compounds, such as phenylmercuritriethanolammonium lactate, have shown promise for the control of apple scab. They are said to be particularly effective in eradicating established scab lesions by burning them out. Because of its mercury content, no residue should be left on the edible portions at harvest time. This compound is also showing promise for the control of certain shade tree diseases. A related metallo-organic compound, phenylamino cadmium di-lactate, has been found to be effective in the control of certain diseases of turf, such as dollar spot.

OTHER MATERIALS

Calcium cyanamide is proving useful for the destruction of certain over-wintering fungus materials, such as the fungus causing brown rot of stone fruits. It has also been used against nematodes. Although the dosage per acre is high, advantage may be taken of its value as a nitrogenous fertilizer at the same time.

Sodium dinitro-*o*-cresolate is being used on a large scale to spray the orchard floor to destroy the overwintering fungus that causes apple scab.

A polymeric product, polyethylene polysulfide is being widely evaluated as a sticker that possesses fungicidal properties. It is not being recommended as the principle fungicidal ingredient.

This list probably could be extended considerably further, but is sufficient to indicate the tremendous activity that is taking place in this field.

The tremendously selective action of the new fungicides and insecticides is frequently mentioned. This is probably a false conclusion logically reached from the circumstantial evidence. The older materials also had their specifity of action. Bordeaux mixture worked on some diseases and not on others. Lead arsenate worked on some insects and not on others. The new materials are generally more effective on a poundage basis than were the older materials, and on the same basis are usually more expensive. Therefore, they are used only where they have outstanding advantages. The appearance of specificity derives from the fact that they are not being used to control a multitude of pests for which they are poorly suited, whereas a decade ago this had to be done because there were so few materials from which to choose.

TABLE II—SOME MANUFACTURERS AND TRADENAMES OF FUNGICIDES, NEMATOCIDES, RODENTICIDES, AND WEED-KILLERS

(Chemicals are listed in the order in which they are discussed in the text.*)

Chemical	Common name or Tradename	Manufacturers
Allyl chlorophenyl carbonates, mixed	M.A.C.C.	Goodrich
2 Aminopyridine		Reilly Tar & Chem.
Ammonium sulfamate	Ammate	Du Pont
Cadmium calcium copper zinc sulfate chromate complex	Crag Turf Fungicide	Carbide and Carbon
Calcium cyanamide	F-531	Du Pont
2-Chloro-4-methyl-6-dimethyl amino-pyrimidine	Aero Defoliant	Amer. Cyanamid
Copper 8-Hydroxquinolinolate	Castrix	
	Copper-8	
	Bioquin 1	Monsanto
Copper zinc chromate complex	658	Carbide and Carbon
2,3-dichloro-1,4-naphthoquinone	Phygon	U.S. Rubber
Dichloropropene-dichloropropane mixture	D-D	Shell Chemical
	Dowfume N	Dow
2,4-Dichlorophenoxyacetic acid and derivatives	Barweed	Amer. Cyanamid
	Chipman 2,4-D weed killer	Chipman
	Du Pont 2,4-D weed killer	Du Pont
	End-o-Weed	Swift and Co.
	Estron 44	Dow
	Free 2,4-D acid	Baker, J. T.
	Penco 2,4-D Weed Killer	Penn. Salt
	Stantox-Weed Killer	Stan. Agric.
	Tufor	U.S. Rubber
	2,4-D Dow Weed Killer	Dow
	Weedanol M	Assoc. Chem.
	Weedanol	Assoc. Chem.
	Weedar	Amer. Chem. Paint Co.
	Weed-No-More	Sherwin-Williams
	Weedone	Amer. Chem. Paint Co.
Dinitro-*sec*-butyl phenol	Dowspray 66 Improved	Dow
Dinitro-*o*-*sec*-amyl phenol	Sinox General	Standard Agr. Chem.
Ethyl mercuric phosphate	New Improved Ceresan	Du Pont
Ethyl mercury p-toluene sulfonanilide	Ceresan M	Du Pont
Ethyl mercuric chloride	Ceresan	
	Semesan Jr.	Du Pont
Ethylene chlorohydrin		Carbide and Carbon
		Dow
Ethylene dibromide	Dowfume W	Dow
	Iscobrome D	Innis-Speiden
		Eston
		Westvaco
Ferric dimethyl dithiocarbamate	Fermate	Du Pont
	Karbam Black	Sherwin-Williams
2-Heptadecyl glyoxalidine	Fungicide 341	Carbide and Carbon
Hydroxymercurichlorophenol	Semesan	Du Pont
8-Hydroxyquinoline benzoate		Merck
Indolebutyric acid	Hormodin	Merck
	Hormo-root	Hortus Products
		American Chem. Plant
Isopropyl-N-phenyl carbamate	I.P.C.	Baker, J. T.
		Columbia Chemical Div., Pittsburgh Plate Glass Co.
Methyl bromide	Dowfume G	Dow
	Iscobrome	Innis-Speiden
		Eston
		Westvaco
		Michigan Chem.
		Pittsburgh Chem. Co.
Methyl ester of alpha-napthaleneacetic acid	Barsprout	Amer. Cyanamid
	Dow Sprout Inhibitor	Dow
	Stop Sprout	Chipman
2-Methyl-4-chlorophenoxyacetic acid	Methoxone	Imperial Chem. Ind.
Mixture of chlorobenzenes	Benochlor 3-C	Chloroben Corp.
α-Naphthyl thiourea	Antu	Du Pont
		Pittsburgh Coke & Chem.
		General Chem.
α-Naphthaleneacetic acid or potassium salt		Kolker
	Clingspray	Amer. Cyanamid
	Fruitone	Amer. Cyanamid
	Parmone	Du Pont
	S.N.A.	Chipman
	Stop-Drop	Sherwin-Williams
	Vitatone	Miller
	Quick Root	Dow
		General Chem.
		American Chemical Paint

NEMATOCIDES

Nematodes are small, usually microscopic, worm-like animals that may cause severe damage to plants by entry through the roots, tubers, or crowns. Their tunneling and feeding may weaken the plant and open the way for secondary invaders.

For the last two years important potato growing areas have been quarantined because of the presence of nematodes. These areas are infested with the golden nematode and vigorous attempts are being made to eradicate this pest. Several other nematodes, such as the root-knot nematode and the sugar-beet nematode, are so widely spread over many areas in continental United States and Hawaii that eradicant measures are, for the moment, impractical. Chloropicrin has been known to be effective against nematodes for the past twenty years and is also a general soil fumigant for killing weed seeds, insects, and fungi. But, since the chemical cost per acre is more than $100, it has not been used much, except for such specialized purposes as greenhouse fumigation.

In 1945, Hawaiian workers published an account of their work with D-D mixture, which is a mixture of dichloropro-

TABLE II—(*Continued*)

Chemical	Common name or Tradename	Manufacturers
Phenyl amino cadmium lactate	Puraturf 177	Gallowhur
Phenyl mercuric cyanamide	Barbak C	Amer. Cyanamid
Phenyl mercury triethanolammonium lactate	Puratized Agricultural Spray	Niagara
	Puratized N5E	Gallowhur Chem.
Polyethylene polysulfide	P.E.P.S.	Goodrich
Potassium cyanate		Amer. Cyanamid
8-Quinilinol	Bioquin	Monsanto
		Pyridium Corp.
Sodium dinitro-*o*-cresylate	Elgetol	Standard Agr. Chem.
	Sinox	
Sodium ethylene bisdithiocarbamate	Dithane D-14	Rohm and Haas
Sodium fluoroacetate	1080	Monsanto
Sodium-isopropyl xanthate	N.I.X.	Goodrich
Sodium pentachlorophenate	Dowicide G	Dow
	Santobrite	Monsanto
Tetrachlorobenzoquinone, or chloranil	Spergon	U.S. Rubber
	Dow-5	Dow
Tetramethylthiuram disulfide	Arasan, Tersan	Du Pont
		Goodyear
		Monsanto
		U.S. Rubber
Tricholoroacetic acid salts		Du Pont
2,4,5-Trichlorophenoxyacetic acid	2,4,5,-T	Dow
		Amer. Chem. Paint Co.
Trichloronitromethane (chloropicrin)	Larvacide	Innis-Speiden
2,4,5-Trichlorophenyl acetate	Mycotox	Givaudan-Delawanna
Zinc dimethyl dithiocarbamate	Karbam White	Sherwin-Williams
	Methasan	Monsanto
	Zerlate	Du Pont
		U.S. Rubber
Zinc dimethyl dithiocarbamate-cyclohexylamine complex	Z.A.C.	Goodrich
Zinc ethylene bisdithiocarbamate	Dithane Z-78	Rohm and Haas
	Parzate	Du Pont
Zinc trichlorophenate	Dow 9B Seed Protectant	Dow

* Except for 2,4-D and the other growth substances there are usally only a few manufacturers for each chemical. With the growth substances a few representative manufacturers and their tradenames have been included, since it would be impossible to include all. There is no claim for completeness of coverage of the manufacturers of the other materials listed. Manufacturers for some of the products discussed that are in the experimental stages are not listed. It will be realized that the most trade-marked materials contain other ingredients such as wetting or conditioning agents in addition to the principal active ingredient. Further, the principal active ingredient may be present in different amounts in different trade-marked materials. Thus the efficiency of the different materials in commerce may vary.

Company Addresses:

American Chemical Paint Co., Ambler, Pa.
American Cyanamid Co., 30 Rockefeller Plaza, New York 20, N. Y.
Associated Chemicals, 505 Sunderland Bldg., Omaha 2, Nebraska
Baker, J. T., Chemical Co., Phillipsburg, N. J.
Carbide & Carbon Chemicals Corp., 30 E. 42 St., New York 17, N. Y.
Chipman Chemical Co., 44 Factory Lane, Bound Brook, N. J.
Chloroben Corp., 15 Exchange Place, Jersey City, N. J.
Columbia Chemical Div., Pittsburgh Plate Glass Co., Fifth Ave., at Bellefield, Pittsburgh, Pa.
Dow Chemical Co., Midland, Mich.
Du Pont de Nemours, E. I. & Co., Inc., Wilmington, Delaware
Eston Chemicals, Inc., 3100 E. 26th St., Los Angeles, Cal.
Gallowhur Chemical Corp., 801 2nd Ave., New York 17, N. Y.
General Chemical Co., 40 Rector St., New York 6, N. Y.
Givaudan-Delawanna, Inc., 330 W. 42nd St., New York 18, N. Y.
Goodrich Chemical Co., B. F., 2060 E. 9th St., Cleveland, Ohio
Goodyear Tire & Rubber Co., Inc., Akron 16, Ohio
Hortus Products, Rutherford, N. J.
Imperial Chemical Industries, 500 Fifth Ave., New York, N. Y.
Innis-Speiden Corp., 121 Liberty St., New York 6, N. Y.
Kolker Chemical Works, 80 Lister Ave., Newark, N. J.
Merck & Co., Inc., Rahway, N. J.
Michigan Chemical Corp., St. Louis, Mich.
Miller Chemical & Fertilizer Corp., 1000 S. Caroline St., Baltimore 31, Md.
Monsanto Chemical Co., 1700 So. Second St., St. Louis 4, Mo.
Niagara Sprayer & Chemical, Div. of Food Machinery Corp., 104 Niagara, Middleport, N. Y.
Pennsylvania Salt Mfg. Co., Widener Bldg., 1335 Chestnut St., Philadelphia, 7, Pa.
Pittsberg Chemical Co., 3100 E. 26th St., Los Angeles, Cal.
Pittsburgh Coke & Chemical, 1905 Grand Bldg., Pittsburgh, Pa.
Pyridium Corp., Yonkers, N. Y.
Reilly Tar & Chemical Co., 1617 Merchants Bldg., Indianapolis, Ind.
Shell Chemical Corp., 100 Bush St., San Francisco 6, Cal.
Sherwin-Williams Co., 101 Prospect Ave., N. W., Cleveland, Ohio
Standard Agricultural Chemicals, Inc., Hoboken, N. J.
Swift & Co., U. S. Yards, Chicago 9, Ill.
U. S. Rubber Co., 1230 Avenue of the Americas, New York 20, N. Y.
Westvaco Chlorine Products Corp., 405 Lexington Ave., New York, N. Y.

penes and dichloropropanes together with minor amounts of other chlorinated hydrocarbons. It was first obtained as a by-product in the manufacture of allyl alcohol by one process. It is now being produced both as a by-product and as a primary product. Since the cost of the D-D mixture per acre is considerably less than chloropicrin, it has found widespread use.

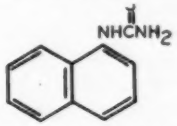
Two other chemicals have been introduced to the trade as nematocides since D-D mixture. These are ethylene dibromide and methyl bromide. Each of the three new nematocides has found its field of usefulness. Their relative effectiveness differs depending on soil moisture, soil type, and temperature. Ethylene dibromide and methyl bromide are more effective when combined with insect and nematode control is desired. When wireworms and nematodes occur together in destructive numbers, ethylene dibromide may be used more economically than the wireworm specifics such as benzene hexachloride.

RODENTICIDES

Estimates of the annual damage caused by rodents on the farm range up to a half-billion dollars a year. In addition to the rat populations that most farms support, extensive damage by field rodents, such as field mice and ground squirrels, is common in many areas.

The rodenticides that have been most widely used in the past have been phosphorous, strychnine, thallium sulfate, white arsenic, zinc phosphide, and red squill. All of these but the last are also powerful poisons to other animals and must be very carefully used. Red squill is a specific poison for rats. Here too, new synthetic compounds are gaining.

It has long been known that phenyl thiourea tastes bitter to some people and has no taste for others, and that this is an inherited characteristic. Such a taste test has been made on many humans. Investigators were, therefore, very surprised to find that rats ate it readily, and a small amount caused death within 48 hours. This discovery resulted in the investigation of a large number of related compounds from which was chosen the more effective α-naphthyl thiourea.



This chemical is particularly toxic to the brown or Norway rat but has not been effective against other rodents. It kills by producing edema in the lungs and literally drowning the rat. Rats not killed by the first application quickly build up a tolerance, so that repeated baitings are usually of no additional value over a single baiting. One of the principal values lies in its specificity and consequent safety factor for other animals.

Sodium fluoracetate has been found to be a highly effective rodenticide against all species so far tested. Unfortunately, it is also highly toxic to all animals. Its use, therefore, should be limited to skilled operators and it is not recommended for public sale. A unique development in its use against field rodents was the discovery that when grain is dipped in a solution containing sodium fluoracetate and a coloring agent, birds will not eat the unnaturally colored grain, while the rodents, being color blind, accept it readily.

A third new rodenticide, 2-cholor-4-methyl-6-dimethylaminopryrimidine was developed in Germany during the war. It is said to be of the same order of toxicity to rats as strychnine and is now being tested in this country.

WEED-KILLERS

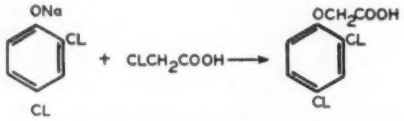
There are more than a billion acres

of land under cultivation today in continental United States. Costs of cultivation, essentially weeding costs, vary tremendously for the same crop in different areas and for different crops in the same area. Mechanical and hand weeding costs may vary from as little as one dollar an acre to more than a hundred dollars an acre depending on the crop and the location. Estimates place cost of cultivation of California crops for control of weeds alone at 8% of the market value of the crops. In addition wet weather often prevents cultivation and the weeds take over. If suitable chemicals are found and they are used to weed only a fifth of the land under cultivation in the United States at an average cost of no more than five dollars per acre, a billion dollar business would be established.

Chemical weed killers have long been known but they have either been so injurious to all plants and remained so long in the soil, or were so expensive that the older representatives, such as the arsenates, chlorates, borates, and choloropicrin, did not find wide use in crop weeding.

This field has undergone a more rapid expansion in the last decade than any of the other fields of agricultural chemicals. There were only three full-time weed control specialists in the country in 1933; today there are more than 100 and more are wanted. This expansion has come about as a result of the introduction of new chemicals, particularly 2,4-dichlorophenoxyacetic acid, its derivatives and relatives. In any field that is changing and expanding as rapidly as this, confusion and uncertainty exist. Therefore, though the statements made here about weed-killers are an attempt to distill the best available opinions, they certainly will be subject to modification before the field becomes stabilized.

The realization that the growth regulating properties of 2,4-dichlorophenoxyacetic acid (2,4-D) and similar materials might be advantageously used to kill weeds has been the prime motivating factor in this expansion. 2,4-D may be prepared from sodium 2,4-dichlorophenate according to the equation:



This compound is offered to the trade under many trademarks, but the common name of 2,4-D has become well established. Commercial preparations are usually either the sodium or ammonium salts, the esters, particularly the isopropyl and butyl esters, and amine derivatives, principally from mixed ethanol or isopropanol amines. Though exceptions exist, the esters have been shown to be the most toxic to weeds and the metallic salts safest to use in selective weeding. The amine salts have been found to occupy an intermediate position between these two extremes. The various derivatives have been rated as nearly equivalent in pre-emergence weeding.

The growth substance sprays, of which 2,4-D is a representative, appear to kill plants by stimulating their metabolism to the point where reserve food supplies are exhausted. At this point the root system becomes soft and spongy and very susceptible to attack by soil microorganisms. Their effective use in most cases has taken advantage of the difference in susceptibility between broad-leafed plants and grasses. Grasses in general are less sensitive, perhaps because they do not take up 2,4-D through the leaves as readily. Thus 2,4-D is finding wide use in weeding corn, sugar-cane, wheat, oats, rice, and other grass-like crops, as well as its better known, though smaller volume, use in eliminating dandelions from lawns. There are resistant broad-leafed weeds, but in many areas the treatment of cereal crops has resulted in 5-20% greater yield. Dosages between one-fourth and one pound per acre are recommended. In application, consideration must be given to the local conditions, the form in which 2,4-D is applied, and the growth stage of the plant, before exact dosage can be determined. This indicates that the margin of safety is narrow. Erratic results in weed control have sometimes been obtained and it may be that 2,4-D will eventually be supplanted by newer, more dependable, chemicals. On the other hand, further study may resolve the difficulties by establishing the necessary limitations on use.

The known hazards involved in the use of 2,4-D at proper dosages are primarily those of drift onto sensitive crop plants. In this respect the damage done to cotton from airplane dusting to control water hyacinths that block canals in the south is well known. Toxicological tests indicate that there is no acute hazard to animals even when grazing on 2,4-D treated areas. Widespread advantage may be taken of this fact in killing weeds, particularly poisonous weeds, in pastures and on the open range. 2,4-D, as such, in effective dosages disappears from moist soil in three to six weeks. It may remain in dry soil for much longer periods of time and constitute a serious hazard in planting subsequent crops.

REPRINTS

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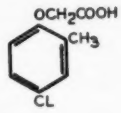
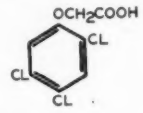
Two analogues of 2,4-D are receiving widespread attention. 2-Methyl-4-chlorophenoxyacetic acid was developed in Eng-

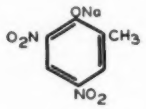


land and has not yet been adequately compared with 2,4-D in this country. 2,4,5-Trichlorophenoxyacetic acid has



shown promise for use against certain woody plants such as brambles.

Sodium dinitro-*o*-cresylate was one of



the first of the new organic weed killers to enjoy wide usage. It has been extensively used in control of small grain weeds, particularly mustard. 2,4-D is taking over a portion of this field but the dinitro compounds, particularly the ammonium salts, are extending their field of usefulness into crops sensitive to 2,4-D such as flax, peas, and new seedlings of alfalfa.

Calcium cyanamide, at the rate of about 200 to 400 pounds per acre, has shown promise in selective weeding of onions and is being used also for asparagus. Related compounds, such as potassium acid cyanamide and potassium cyanate, are also being tested.

Although not strictly within the scope of this paper, mention should be made of the selective weeding that is being done with petroleum fractions particularly on carrots. Stoddard solvent seems nearly ideal for this use. Kerosene fractions are less suitable because carrots weeded with them often develop a kerosene-like taste.

Ammonium sulfamate has been used successfully for eradication of poison ivy and other woody shrubs. This and 2,4-D both show promise in killing stumps and eliminating sucker growth when applied to freshly cut stumps of shrubs or trees.

Sodium pentachlorophenate and pentachlorophenol in oil are being used extensively in Hawaii to control weeds in pineapple and sugar-cane fields. They are receiving attention by workers in this country particularly on 2,4-D sensitive plants, such as cotton.

Other new materials include: a mixture of chlorobenzenes, which seems to be especially promising in equatic weed control; the sodium and ammonium salts of

trichloroacetic acid, mixed allyl chlorophenyl carbonate, and sodium isopropyl xanthate. The last-mentioned is showing promise in early post-emergence weeding on peas and beans. In greenhouse tests isopropylphenyl carbamate showed specific toxicity to grasses while allowing broad-leafed plants to grow unchecked. Unfortunately, in most field experiments, it has failed to live up to its initial promise.

A new concept in weed control, pre-emergence weeding, is receiving widespread experimental attention but no general recommendations can be made now. In pre-emergence weeding, the chemical is applied to the soil before the crop comes up and the germinating weed seeds and young seedlings are killed. The slower germinating crop then comes through untouched. If results continue to be favorable, this may become one of the most widely used methods of weed control.

The preceding discussion has paid little attention to the older theories that cultivation is necessary for proper aeration of the soil and that root-pruning is desirable. The latter theory has been pretty thoroughly disproven and the former found to hold only in certain special cases. It would seem that the prime object of cultivation, after the crop has been planted, has been weed control and that this function will be increasingly taken over by chemicals.

DEFOLIATION AND VINE KILLING

Essentially, both defoliation and vine killing are types of weed killing. However, they are special types in that it is desired to kill only parts of the plants. In cotton defoliation it is desired to make all the leaves fall without injury to the stems or bolls so that mechanical pickers can work. In the case of potatoes the vines are to be killed without any effect on the tubers.

Calcium cyanamide is the most widely used cotton defolient. At about twenty pounds per acre this chemical causes the leaves to drop within approximately a week after application. Unfortunately, it does not work well under dry conditions. In addition to rendering picking easier, defoliation reduces bollrot by allowing the bolls to open and giving them better ventilation. Defoliation is also being tried on tomatoes, late in the season to allow all the fruit to ripen before frost; on ramie (the new fiber crop) and on soybeans.

More attention is being paid to harvesting potatoes when the market is high. To do this the vines must be killed. Other factors such as disease or the approach of frost may make killing of vines desirable. Organic chemicals successfully used for this purpose are dinitro-*o*-*sec*-amylphenol and dinitro-*sec*-butylphenol in mineral oil. When used at too high a dosage, or when the potatoes are too immature, they may cause vascular discoloration.

Carbide and Carbon Chemicals Co.

Experimental plots showing potato disease control. The use of nematocides and weed killers has increased crop yields from once-infested fields as much as 400% per acre.

BLOSSOM THINNING

Hand thinning of apples is commonly practiced to allow the remaining apples to grow larger. The center blossom in each cluster at the "full blossom" stage has already been pollinated and the fruit started while the other blossoms in the cluster have not been. It has been found that the application of certain dinitro compounds, particularly sodium 2,4-dinitro-*o*-cresylate, creosote oil, or naphthaleneacetic acid and derivatives, at this stage will injure many of the unpollinated blossoms sufficiently to cause a lighter set of fruit. The materials behave differently on different varieties, and detailed recommendations have been worked out for only a few. This type of treatment has been found particularly useful in controlling biennial bearing. Sodium 2,4-dinitro-*o*-cresylate has also been used to thin peaches and pecans.

GROWTH REGULATORS

This field is related to weed killers only in that certain of the growth regulators, such as 2,4-D, used at higher dosages are weed killers. The field of growth regulators as such involves their use for certain desirable effects on the plant itself. This is an important field of the future in which present developments may be only indications of what can be done. Already many cuttings that are difficult to root may be induced to form roots by the application of such chemicals as indolebutyric, alpha-naphthaleneacetic, or 2,3-dichlorophenoxyacetic acids, or their sodium or potassium salts. *o*-Chlorophenoxypropionic acid has been used to control seedstalk development in celery. Dusts or sprays of alpha-naphthaleneacetic acid or alpha naphthaleneacetamide have been successfully used to prevent premature fruit drop on apples. For this purpose, sprays are made up that contain only 0.0008 lbs./100 gals. of the active ingredient. Used as a dust about 0.3 pounds of the active ingredient per acre of orchard is sufficient to prevent fruit drop. Work to prevent premature drop of other fruits, such as pears, oranges, peaches, and grapes, shows promise. In greenhouses, fruitset (artificial initiation of fruit development) of tomatoes with resultant seedless fruit has been successfully achieved on a commercial scale with certain of the indole, naphthaleneacetic and phenoxyacetic growth substances.

Ethylene chlorohydrin and thiourea have been used to break dormancy in potatoes. The methyl ester of alpha-naphthaleneacetic acid has been found to induce dormancy and prevent potato sprouting. Colchicine has been used to induce genetic changes such as *polyploidy* (multiplication of chromosome number) that have in turn resulted in the production of new and sometimes more vigorous varieties.

These are important developments and also leads that justify further work. Many new materials are needed. An active search is being made to find chemicals that will delay opening of buds of fruit trees until the frost free period is reached, without any adverse affect on the trees.

Many points remain to be clarified in the new materials we already have: What are the chronic toxic effects on animals? What effect do they have on the nutrient value of the crops treated? How long do they remain in the soil and do they build up to toxic levels? What are the best ways to use them? These and other questions need be answered before the field becomes stabilized.

Many gaps still exist in the field of agricultural chemicals. We have no suitable bactericides for agricultural crops, though the introduction of the quaternary ammonium compounds has been a boon to dairy cleanliness. We do not know how to control virus diseases. Always we must search for compounds that will have fewer undesirable side-effects while accomplishing their primary purpose.

CAUSTIC PURIFICATION

by Liquid-Liquid Extraction

by H. C. TWIEHAUS* and N. J. EHLERS**
Columbia Chemical Division, Pittsburgh Plate Glass Company
Natrium, West Virginia

DIAPHRAGM CELL CAUSTIC soda is too impure for many of the most rapidly increasing uses. Liquid-liquid extraction purifies it, allows it to compete with amalgam cell and lime-soda products.

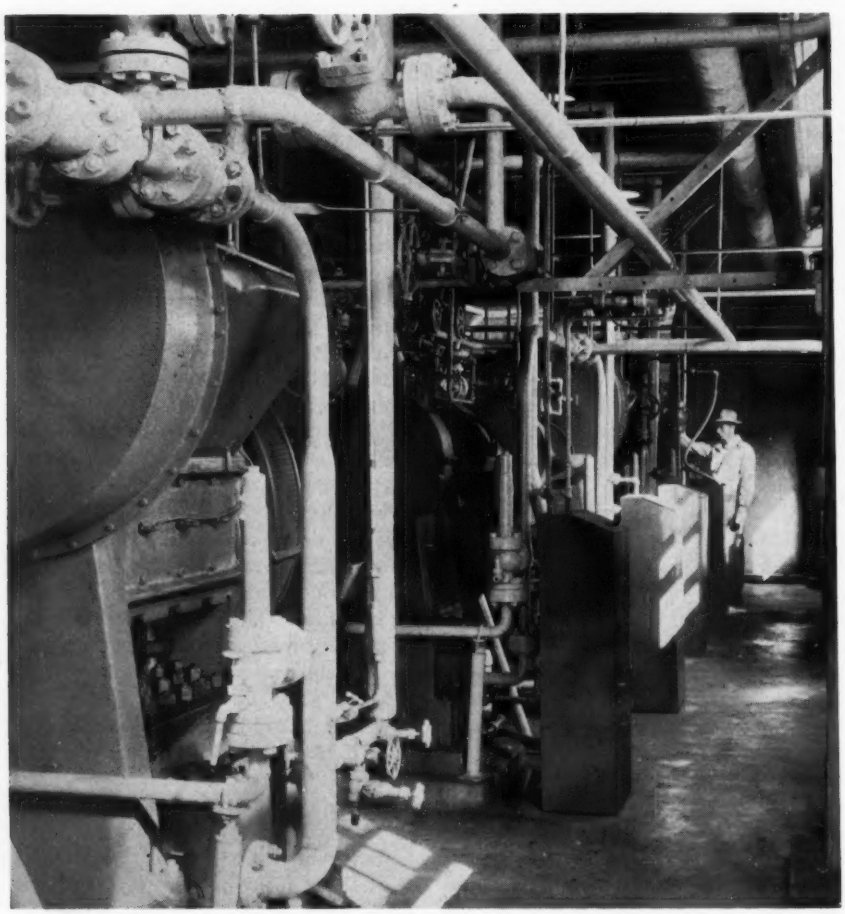
ALONG with industry as a whole, the heavy chemical industry has felt and heeded demands for an increasing tonnage of product of higher quality at lower cost. Rapidly rising costs of investment, labor, and materials make most difficult the problem of holding costs at a minimum while maintaining or improving standards of quality. Yet, there is constant pressure on alkali producers for a higher purity caustic, especially from those consumers who can lower their own costs or improve their own product by raising the quality of raw material.

The increase in consumption of caustic soda in the rayon and transparent film industry, and in the special chemical industry, has been most pronounced. Consumption by the soap, pulp and paper, textile, oil refining, and lye and cleanser industries, too, has grown. Production of electrolytic caustic soda has been increasing rapidly,† and these is little reason to believe that this same trend will not continue for some time.

This sharp rise in the manufacture of caustic soda by the electrolytic method is due, in a large measure, to the extraordinary demand for chlorine, co-product in the electrolysis of salt brine. The fact that chlorine demand is increasing faster than caustic demand leads to the conclusion that some time in the 1950's, caustic soda produced by electrolytic chlorine, caustic cells will satisfy the needs of this country. Caustic soda by the lime-soda process may be entirely eliminated. Therefore, the eyes of all alkali manufacturers, especially those operating lime-soda units, are on the mounting demand for chlorine.

HIGH PURITY PRODUCTION

In addition to the interdependence of these two commodities, an important factor in the alkali picture is the demand for high purity caustic soda which is outstripping even the booming demand for all caustic soda. Principal consumers of this special grade are the rayon, cold-process soap, and special chemical industries.



High pressure positive displacement pumps for ammonia and diaphragm cell caustic.

* Process Engineer.
** Assistant Plant Superintendent.
† Lamie, R. K. and MacMullin, R. B., "U. S. Chlorine," *Chemical Industries 62*, 4, 578-583 (April, 1948).

SALIENT

(a) Caustic soda production in the United States has more than doubled since 1940.
(b) Electrolytic chlorine-caustic cells will furnish the future needs of caustic soda since chlorine demand is increasing faster than caustic soda demand. Lime-soda caustic production will be eliminated if this trend continues.
(c) The demand for high purity caustic soda is increasing at a faster rate than the demand for all caustic soda.

Several methods for electrolytic diaphragm cell caustic purification have been practiced on a commercial scale in the United States. They are:

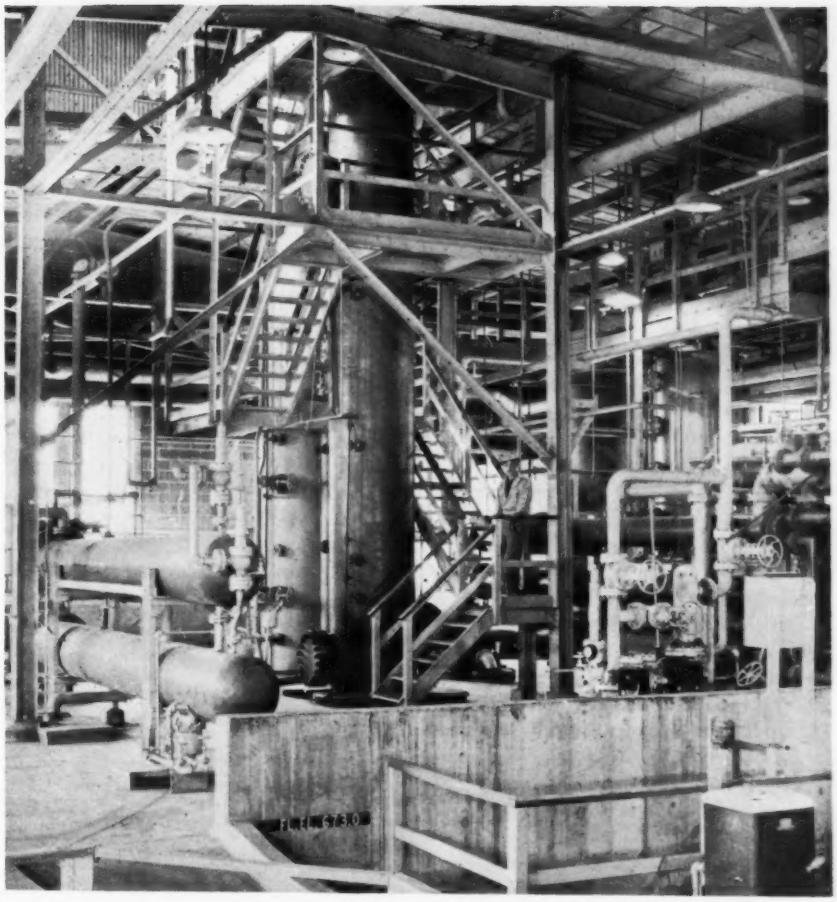
(1) Dialysis.
(2) Crystallization of a hydrate of NaOH. The most common are $NaOH \cdot 3.5\,H_2O$ and $NaOH \cdot 2\,H_2O$.
(3) Purification by adding sodium sulfate to form a triple salt.
(4) Liquid-liquid extraction using ammonia.

Processes for the purification of lime-soda caustic, too, have been improved so that lime-soda caustic is acceptable to the rayon and special chemical industry. But, again, alkali manufacturers are concerned over the dark future of any process other than the electrolytic decomposition of salt brine.

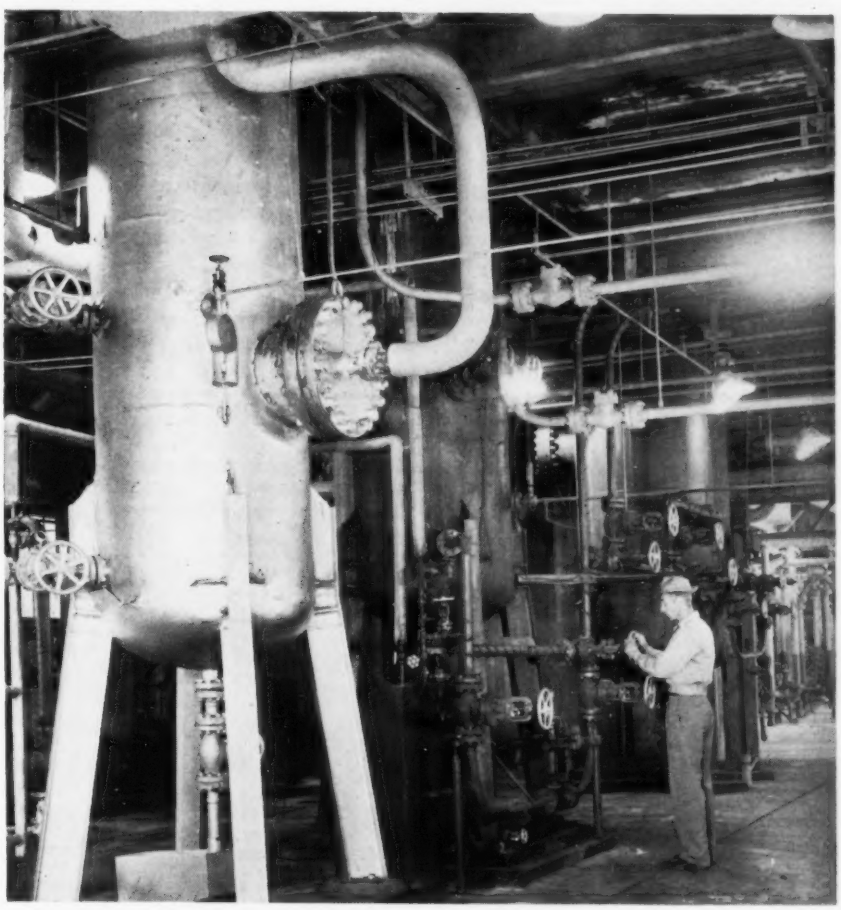
The mercury, or amalgam cell, which was first installed in this country just prior to 1900, is in competition with the electrolytic diaphragm cell. At present, amalgam cells account for approximately 5% of the caustic produced in this country. This type of electrolytic cell to decompose salt brine into chlorine and a high quality caustic, has been given considerable publicity since the investigation of German practice immediately following the last war. Robert B. MacMullin in "Diaphragm vs. Amalgam Cells" in the July 1947, *Chemical Industries* compares operating characteristics, product quality, and costs.

WHICH CELL?

Producers of chlorine and caustic soda are now weighing various factors to determine whether expansion should be with the diaphragm cell or the amalgam cell. Some factors under consideration by individual plants are: the type of salt available (whether it is as a solid or as a brine), and its cost; the method of obtaining power, and whether steam is available at low cost; the inevitable fu-



Second floor, showing top of ammonia still, extraction column and other equipment.



Lower section of ammonia still, liquid-liquid extraction column, and flash tank.

FACTORS

(d) In competition with the various methods of electrolytic diaphragm cell caustic soda purification are: (1) purification of lime soda caustic soda, and (2) the amalgam or mercury type electrolytic cell.

(e) The process of liquid-liquid extraction of impurities from diaphragm cell caustic by ammonia gives a product of high purity at a low cost. Four commercial units are now in operation, and there is considerable interest in additional units.

ture needs of U. S. industry for a low cost low purity caustic, as well as a low cost high purity caustic; future availability of mercury or asbestos in this country; and investment costs. The probable outcome will be that the percentage of the chlorine and caustic soda produced by the mercury cell in this country will increase over that of the past. For many producers, it will be more economical to expand diaphragm cell production and install a satisfactory purification process.

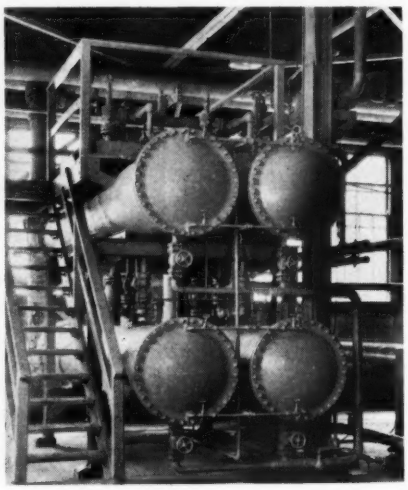
LIQUID-LIQUID EXTRACTION

For those producers who find it economically wise to increase their high purity caustic production using diaphragm cell caustic as a source, the liquid-liquid extraction process using liquid ammonia offers numerous advantages. Ten years of development and operation experience by the Columbia Chemical Division of the Pittsburgh Plate Glass Co. have resulted in a highly perfected method of purification. Four commercial units, all larger than 100 tons per day (anhydrous weight caustic), use this process. Three are Pittsburgh Plate's plants—Lake Charles, La.: Natrium, West Virginia; and Barberton, Ohio. The fourth is the Westvaco plant at South Charleston, West Virginia.

The ammonia purification process consists of the continuous extraction of NaCl and $NaClO_3$ in 50% diaphragm cell electrolytic caustic by the counter-current flow of liquid caustic and liquid ammonia in an extraction column at suitable temperature and pressure. After contact, the caustic and ammonia separate into two immiscible phases. They are separated by drawing the caustic from the bottom of the extractor, and the ammonia containing the impurities from its top.

The purified product is obtained when residual ammonia is removed from the caustic phase. The ammonia phase is freed of extracted impurities and recirculated to the extraction unit. In the extraction, 95% of the electrolytic diaphragm cell caustic introduced into the purification system, is obtained as a purified product, the other 5% being recovered in the NH_3, still bottoms. NaCl and $NaClO_3$ are the major impurities removed.

The impure 50% electrolytic diaphragm caustic is pumped by a high pressure positive displacement pump through an automatically controlled caustic preheater into the extractor near the top of the extraction column. Similarly, the liquid ammonia is pumped into the extractor near the bottom of the column.



Ammonia condenser and flash tank.

Both the caustic solution and liquid ammonia are introduced into the vertical extraction column in the form of small droplets, which, after countercurrent liquid-liquid contact, separate into immiscle phases. The lighter liquid ammonia, introduced near the bottom of the column, flows upward and collects the impurities in the ammonia phase at the top of the column. The heavier caustic, introduced near the top, flows downward and collects as purified caustic in the bottom of the column. In the upper portion of the extraction column, the small droplets of caustic flow downward through a continuous ammonia phase, while in the lower portion of the column, small droplets of liquid ammonia flow upward through a continuous caustic phase.

Unpurified electrolytic caustic is introduced into the extraction column at a concentration of 49 to 51%, while the liquid ammonia is introduced at a concentration of 70 to 95%. The strength of the liquid ammonia controls the concentration of the purified caustic. Final product strength can be varied from no increase over the feed strength to a very large increase.

In most plants the NaCl content of electrolytic diaphragm cell caustic varies from .9 to 1.1% (as is basis), while the $NaClO_3$ content varies from .05 to .10% (as is basis). The quantity of ammonia circulated per ton of caustic product determines the amount of NaCl extracted, or, an increase in the ammonia:caustic ratio decreases the NaCl content of the product. The $NaClO_3$ content of the product is low, even at low ammonia: caustic ratios. Extremely low concentrations of NaCl, below .01%, have been obtained experimentally at high ratios of ammonia to caustic. In such runs, the tonnage capacity of the extractor was reduced, and the quantity of steam required for ammonia distillation was increased. In plant practice the extraction unit is operated to obtain a purified product with about .08% NaCl and .0002% $NaClO_3$ (Table A).

The operating pressure of the extractor is controlled by continually withdrawing the upper liquid ammonia phase, containing the extracted impurities, from the column through a pressure control valve to the ammonia still. The ammonia phase is purified and concentrated in the ammonia distillation column. Anhydrous ammonia vapor from the top of the distillation column is condensed and returned to the anhydrous ammonia storage tank. This ammonia is then recirculated through the extraction column for further purification of caustic. The impurities, such as NaCl, $NaClO_3$ and 5% of the caustic feed, which have been extracted from the electrolytic caustic in the extraction column, are recovered as still bottoms from the ammonia distillation column. The ammonia content of the still bottoms during normal operation is so low that further recovery is unnecessary.

The solubility of the ammonia in the caustic phase makes it necessary to free the caustic product of residual ammonia. Purified caustic is drawn through a control valve which controls the interphase level. It is flashed in a flash or separating tank at a reduced pressure equal to that of the ammonia condensing system. Ammonia vapors from this flash tank are combined with the ammonia from the

Table A*

Comparison of the Quality of Caustic Soda Produced by Various Methods

(All analyses on an "as is" basis)

	I. *Diaphragm Cell Regular*	II. *Diaphragm Cell PPG Purified***	III. *Lime Soda Rayon Grade*	IV. *Mercury Cell*
NaOH	50.00	50.20	50.00	50.00
Na_2CO_3	.10-.30	.15	.10	.10- 20
Na_2SO_4	.013-.020	.01	.055	.004-.0020
NaCl	1.00	.08	.20	.002-.001
$NaClO_3$	.05-.10	.0002	—	—
CaO	.0017	.0010	.0013	.001-.002
MgO	.0010-.0020	.0010	.0023	.0001
Al_2O_3	.0013-.0030	.0015	.0030	.0010-.0012
SiO_2	.018-.025	.009	.020	.0030-.0010
NH_3	—	.00015	—	—
Fe	.0005	.00025	.0004	.0001-.0088
Ni	.00003	.00001	.00005	—
Cu	.00003	.00002	.00007	.00002
Mn	.00001-.00006	.00003	.00004	—
Hg	—	—	—	10^{-6}

* Table as given by R. B. MacMullin in *Chemical Industries*, July, 1947, p. 50.
** Analysis on Diaphragm Cell Caustic, PPG purified, as corrected by R. B. MacMullin in *Chemical Industries*, Sept., 1947, p. 348.
Correction made because some analysis given in the July issue on the PPG product were on an "anhydrous caustic" basis, and some on an "as is" basis.

Table B

Comparison of Costs in Plants of Different Sizes

(All Costs Basis Jan., 1947)

	Unit Price	*54 Tons/Day (Anhydrous NaOH Basis)*		*150 Tons/Day (Anhydrous NaOH Basis)*	
		Unit Consumption	Cost Per Item/Ton	Unit Consumption	Cost Per Item/Ton
(1) Labor, hrs.	$1.35	0.445	$.60	0.16	$.22
(2) Repairs			.46		.30
(3) Ammonia Loss, Lb.	.05	3.3	.17	1.5	.08
(4) Steam, M lb.	.35	1.2	.42	0.8	.28
(5) Electricity, KWH	.003	16.0	.05	13.0	.04
(6) Water, M. Gal.	.02	27.0	.54	24.0	.48
(7) Reprocessing End Liquor			.27		.27
(8) Works Overhead (15% of $221,000 Invest.)			1.71	(15% of $370,000 Invest.)	1.00
(9) Royalty, 2% of Sale Price of $40.			.80		.80
Cost of Purifying 1 Ton NaOH			5.02		3.47
Cost Per Unit of NaOH-Cl_2			2.66		1.84

* R. B. MacMullin's article "Diaphragm vs. Amalgam Cells," *Chemical Industries*, July, 1947, p. 49.

distillation column, condensed, and returned to the ammonia storage tank. The remaining ammonia is then removed from the caustic in a steam evaporator, operating below atmospheric pressure, with a resulting slight concentrating of the caustic product. The ammonia content of the caustic is thus reduced to .00010 from .00015% (as is basis). The caustic product is then cooled and sent to storage.

The ammonia and water vapors from the evaporator are cooled and pumped into the ammonia absorber. The aqueous ammonia from the absorber is used to control the strength of the liquid ammonia to the extraction column.

The purified electrolytic diaphragm cell caustic is then treated with absorptive agents for the removal of heavy metals. This method of treatment has been used by many alkali producers for a number of years for the removal of heavy metals from unpurified electrolytic diaphragm cell caustic and lime soda caustic. The analysis (Table A) shows the extent of the heavy metal removal from purified diaphragm cell caustic over regular diaphragm cell caustic.

INVESTMENT AND OPERATING COSTS

Commercial units of 50 ton (anhydrous caustic weight) per day capacity and higher are economically competitive. All purification plants now in operation in this country are larger than 50 tons per day in size with a resulting lower cost of investment and cost of operation per ton of product.

Table B shows a comparison of costs in a 54 and in a 150 ton per day plant. A description of the various items of cost follows:

(1) *Labor.* The purification unit is so designed that complete instrumentation for automatic control is possible. No matter the size of the unit, one operator a shift can adequately control operations.

(2) *Repairs.* Proper materials of construction for low maintenance are included in the investment cost. Nickel is used where caustic temperatures would be high enough to cause excessive corrosion of iron. Continuous 24 hour a day operations for eight weeks are common before maintenance shutdown is needed.

(3) *Ammonia Loss.* The loss of ammonia is strictly a function of plant design and the care in operations. Losses in one plant varied from .5 to 2.6 lbs. per ton with a 1947 average of 1.5 lbs. NH_3 per ton of purified product.

(4) *Steam.* Steam at a minimum of 175 psig is needed in the ammonia still for separation of the extracted impurities and the ammonia for recycle. All other steam can be at low pressure. Improvements in the process since the middle of 1947 have dropped steam consumption in a large plant to 800 lbs. per ton of purified product.

(5) *Electricity.* Power consumption is not an important factor in cost. The entire load is in pump drive.

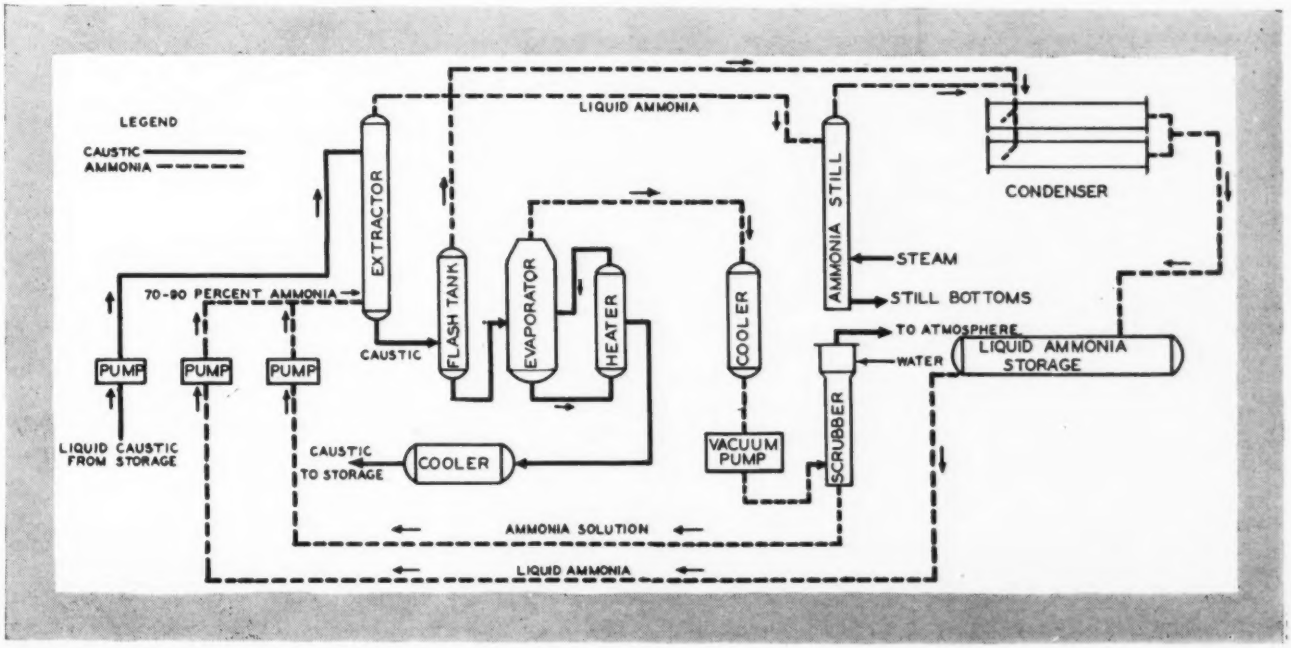
(6) *Water.* Most of the water required is for condensing ammonia from the still and the first stage of ammonia removal from the purified caustic. Water costs are given at 2 cents per 1000 gallons. This is high for some plants.

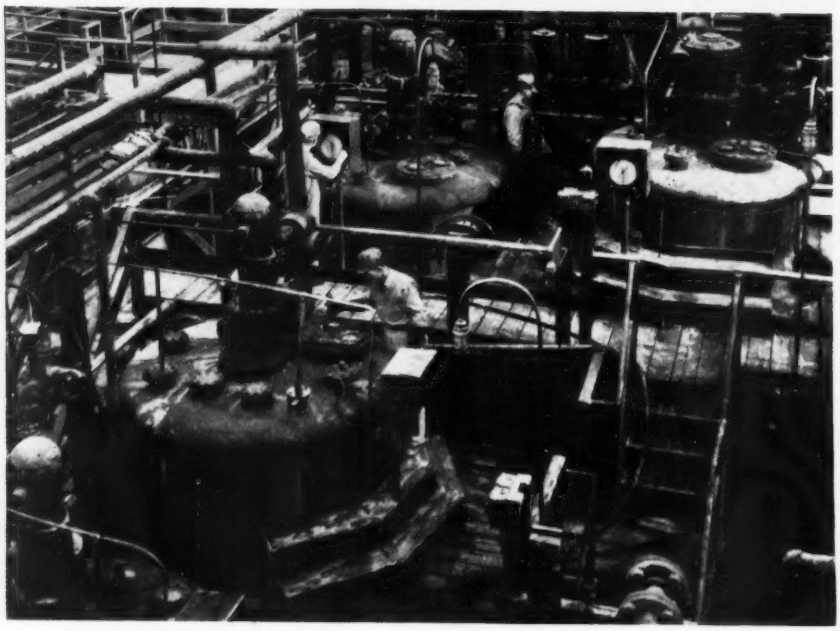
(7) *Reprocessing End Liquor.* This cost is for the recovery of caustic in the still bottoms. There is no loss of caustic in this process of purification.

(8) *Works Overhead.* As is typical in commercial units of this nature, the larger the unit, the lower the cost of investment. The following approximate investment costs for various sized units are based on the Jan., 1947, value of the dollar:

Tons capacity/day	*Investment/ton/day plant capacity*
54	$4,100
100	2,750
150	2,470

(9) *Royalty.* 2% of the sales price, which was about $40 per ton in January, 1947, is the royalty payment for use of the process.





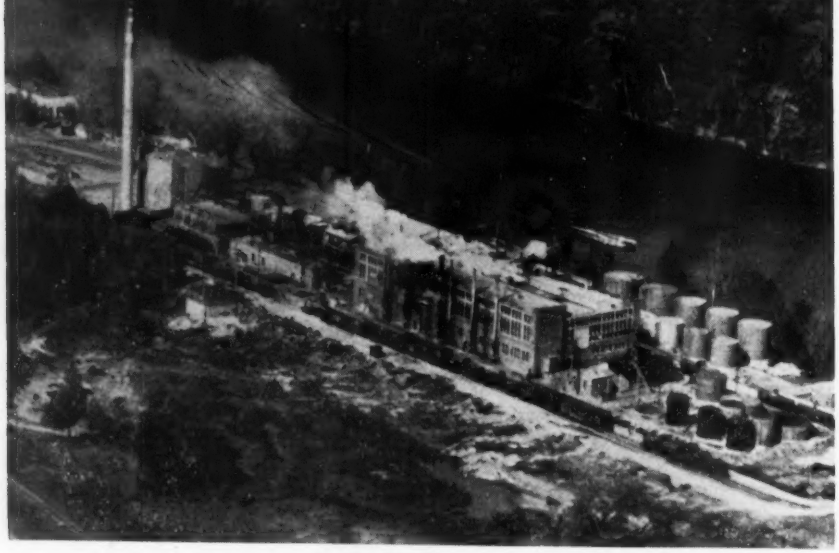
Phenol via sulfonation: Monsanto Chemical Co., Monsanto, Ill.

A **CI** REPORT ON

PHENOL

Part 2: Cost of Production

by R. F. MESSING and W. V. KEARY
Arthur D. Little, Inc., Cambridge, Mass.



Phenol via sulfonation: Reichhold Chemicals, Inc., Tuscaloosa, Alabama.

PHENOL PRODUCTION COSTS via all commercial processes are comparable for 15 million pound-per-year units, being largely dependent on by-product credits. A distinct advantage lies with the chlorination process for 100 million pound units.

THE THREE different processes for the synthesis of phenol that are in use in the United States involve sulfonation or chlorination of benezene, and subsequent hydrolysis. That they are competitive in terms of cost is made clear by the pattern of expansion in the industry since World War II: two sizable expansions have been completed for the sulfonation process and one for the direct chlorination process, and a multi-million dollar expansion is being readied by Durez for the Raschig process.[7]

Two of the present producers of synthetic phenol operate the chlorbenzene process, one uses the Raschig process, while three employ the sulfonation route. Another is scheduled to begin operation of the sulfonation process this summer.

Costs by these methods are estimated on the basis of published texts[9,10], published reports of producers, reports of producers, reports on German operations[8], and the author's knowledge of the methods. They do not include sales, administrative or research expenses. The estimates assume purchase of raw materials at quoted prices and construction of the plant at early 1948 cost levels; consequently, they may be somewhat higher than the cost figures used by producers.

Costs by the three routes are closely comparable, but are largely dependent upon the by-product credits associated with each process. If economic outlets are available for polychlorbenzene and diphenyl compounds, the chlorbenzene process appears to be the lowest-cost method, yielding phenol at an estimated cost of 8.3¢ per pound in a 15 million pound-a-year plant, as compared with a cost of 8.7¢ per pound if production of by-products is minimized. Correspondingly, the cost of producing phenol by the sulfonation process is estimated at 9.5¢ per pound, allowing credit for the by-product sodium sulfite. The Raschig process is estimated to yield phenol at a cost of 9.2¢ per pound, and leads to minimum formation of by-products.

DESCRIPTION OF PROCESSES

CHLORBENZENE PROCESS

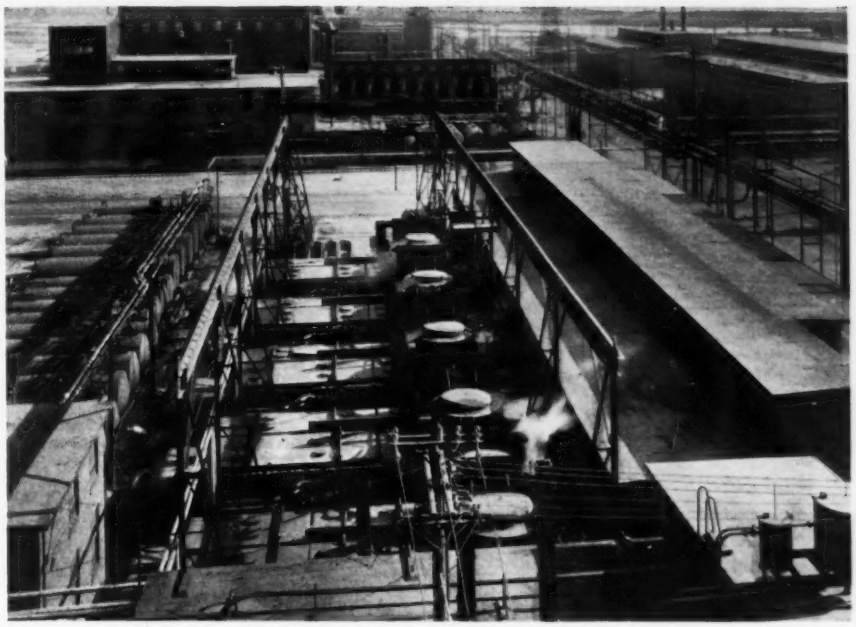
The hydrolysis of chlorbenzene is the most important commercial method for

production of synthetic phenol. Dow Chemical Co., the largest producer,[1,4] has found the method to be economical principally because of the opportunities for disposal of the by-products – polychlorbenzenes, diphenyl oxide, and phenyl phenols – in its other manufacturing operations. The formation of by-products may be minimized, however, by recycling of diphenyl oxide to prevent further formation in the hydrolysis step, and by utilizing continuous processing methods with low conversions of benzene per pass to reduce greatly the polychlorbenzene by-products. The latter method of operation has been installed by the General Electric Co. in its plant at Pittsfield, Mass.[6] Both of these companies recycle sodium chloride for conversion to the caustic and chlorine required.

Monochlorbenzene is produced by reaction of liquid benzene at approximately 50° C, with chlorine gas. The classic methods for carrying out the reaction involve the use of batch reactors, dichlorination being controlled by predetermined reaction conditions. It is possible to vary the ratio of production of monochlorbenzene to dichlorbenzene over wide limits by controlling the temperature, and the rate and total addition of chlorine. In a continuous process, as practiced by American companies, the conversion of benzene to monochlorbenzene per pass is limited to about 35% so that only about 5% of the benzene converted appears as the dichlor derivative. It is believed that operation of the process so as to yield larger amounts of dichlorbenzenes is attractive if profitable outlets for these by-products.

After purification by distillation, the monochlorbenzene is mixed with recycled diphenyl oxide and emusified with 10% caustic soda solution. Two mols of caustic soda are theoretically required for the reaction, but in practice a 20% excess is usually employed. The mixture is then pumped through a heat exchanger and reactor at about 680° F. and at a pressure of approximately 4000 psi. Under these conditions, monochlor is hydrolized to produce sodium phenate and sodium chloride. Diphenyl ether is separated and recycled, while the sodium phenate is subsequently sprung (hydrolyzed) with hydrochloric acid produced in the chlorination section plus a little make-up acid. Equations for the reactions are shown in the accompanying Table 1 and presented as a flow chart in Figure 1.

Care is exercised to dry the benzene thoroughly by distillation, and the chlorine by scrubbing with sulfuric acid. Steel and cast iron have been found to be satisfactory materials of construction when dry reactants are used in the chlorination section. Wet hydrochloric acid produced in this process is, of course, handled with special materials such as glass, tantalum, Karbate and Hastelloy B. Carbon-moly steels have been used for equipment in the hydrolysis section, but producers are understood to favor special materials such as nickel or Inconel for this service.



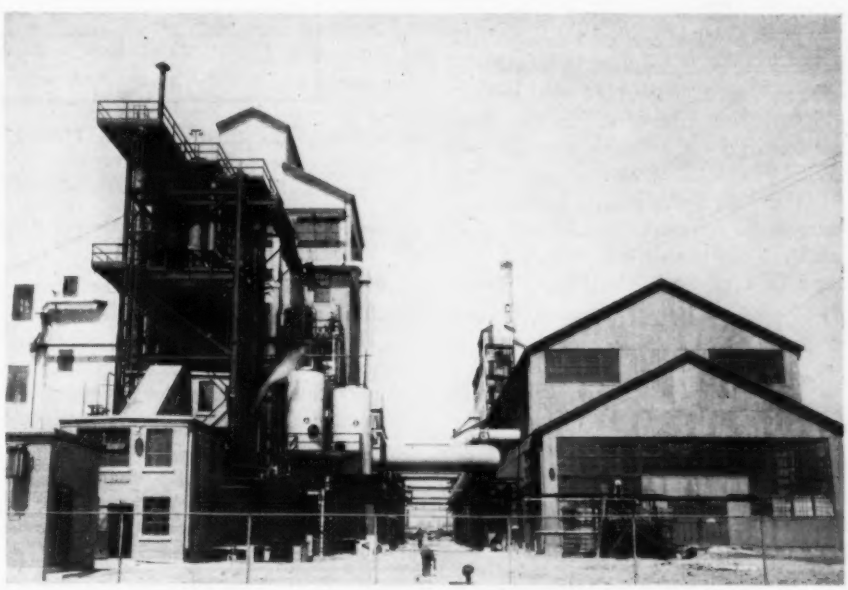
Phenol via chlorination: Dow Chemical Co., Midland, Mich.

It has been found economical to recycle the sodium chloride produced in the hydrolysis reaction for electrolysis to chlorine and caustic. When this procedure is used in conjunction with minimum by-product formation, as practiced by General Electric in Pittsfield, the process compares favorably from the standpoint of raw materials cost with the Raschig process. An overall yield of 92% in conversion.

SULFONATION PROCESS

Of equal importance in the manufacture of synthetic phenol is the reaction of benzene with sulfuric acid, followed by fusion with caustic soda. These steps result in the sodium derivative of phenol, which produces free phenol upon acidification. In general two methods are available for processing the benzene sulfonic acid: (1) Direct fusion, followed by springing with sulfuric acid, and (2) Neutralization with sodium sulfite before fusion, followed by springing with the sulfur dioxide produced in the neutralization. These reactions are summarized in the attached Table 2, and in Figure 2.

The sulfonation process is obviously complex, and several variations in each of the reaction steps have been employed both in this country and abroad. To permit the sulfonation reaction to proceed to completion, it is necessary to remove the water of reaction formed. This has been accomplished by addition of oleum,



Phenol via the Raschig process: Durez Plastics and Chemicals, Inc., N. Tonawanda, N. Y.

and by sweeping out the water with benzene vapors at the end of the reaction step. In the descriptions of German operations which have appeared in the reports of the Publication Board, a large excess of sulfuric acid is stated to be used for this purpose. The acid is finally neutralized with lime to make calcium sulfate, which has virtually no by-product value. Hence the process probably would be uneconomic in American practice.

The sulfonation step is usually carried out as a batch reaction, which, together with the addition of liquid benzene to the acid, makes possible the use of low temperatures for a large part of the sulfonation. This step is followed by a period of operation at high temperature with benzene in the vapor phase, during which the reaction is completed. Several schemes have been proposed to reduce by-product formation by the introduction of other materials to the sulfonation reactor, but it is believed that close control over the sulfonation reaction is the favored solution to the problem. A stepwise sulfonation procedure has greatly reduced the production of the undesirable by-product sulfones.

Conversion of the sulfonic acid group to the hydroxyl group in phenol can be accomplished by fusion with 70% or anhydrous caustic soda. Since an excess of caustic is required, sodium phenate is produced as the fusion product. The phenate is then sprung by reaction with an acid.

The neutralization of the benzene sulfonic acid with sodium sulfite results in a neutral salt which is more easily handled in the fusion equipment, and yields sulfur dioxide which may be used for the final springing. In Germany, however, the sulfur dioxide was sold to an adjacent sulfuric acid plant.

Direct fusion of the benzene sulfonic acid, the alternative procedure, is more difficult to control and by-product formation during fusion is believed to be more troublesome. Methods to minimize the evaporation load required in connection with the neutralization of the sulfonic acid have been attempted, but have been complicated by the severe corrosion and mechanical problems encountered.

If fusion of either sodium benzene sulfonate or benzene sulfonic acid with caustic uses 100% caustic soda, which is produced in a gas-fired, nickel-lined, caustic concentrator, a fusion apparatus of similar construction is used. Upon completion of the reaction, the anhydrous fusion mass is discharged to a mixing tank where it is slurried in recycled wash liquors. The sodium sulfite by-product is insoluble in this solution, and is separated by filtration, or, in the newer plants, by continuous basket centrifugal machines. The sodium sulfite cake produced as a by-product is dried in a gas-fired rotary drier, and that portion of the material not required for neutralization of the benzene sulfonic acid is sold.

TABLE 1

Sulfonation Processes for Synthetic Phenol

1. a. $C_6H_6 + H_2SO_4 \longrightarrow C_6H_5SO_3H + H_2O$

Benzene — Benzene sulfonic acid

b. $C_6H_5SO_3H + 3NaOH \longrightarrow C_6H_5ONa + Na_2SO_3 + 2H_2O$

Sodium Phenate

c. $C_6H_5ONa + \frac{1}{2}H_2SO_4 \longrightarrow C_6H_5OH + \frac{1}{2}Na_2SO_4$

Phenol

or overall reaction

$C_6H_6 + 1\frac{1}{2}H_2SO_4 + 3NaOH \longrightarrow$

$C_6H_5OH + Na_2SO_3 + \frac{1}{2}Na_2SO_4 + 3H_2O$

2. a. $C_6H_6 + H_2SO_4 \longrightarrow C_6H_5SO_3H + H_2O$

b. $C_6H_5SO_3H + \frac{1}{2}Na_2SO_3 \longrightarrow C_6H_5SO_3Na + \frac{1}{2}SO_2 + \frac{1}{2}H_2O$

Sodium benzene sulfonate

c. $C_6H_5SO_3Na + 2NaOH \longrightarrow C_6H_5ONa + Na_2SO_3 + H_2O$

d. $C_6H_5ONa + \frac{1}{2}SO_2 + \frac{1}{2}H_2O \longrightarrow C_6H_5OH + \frac{1}{2}Na_2SO_3$

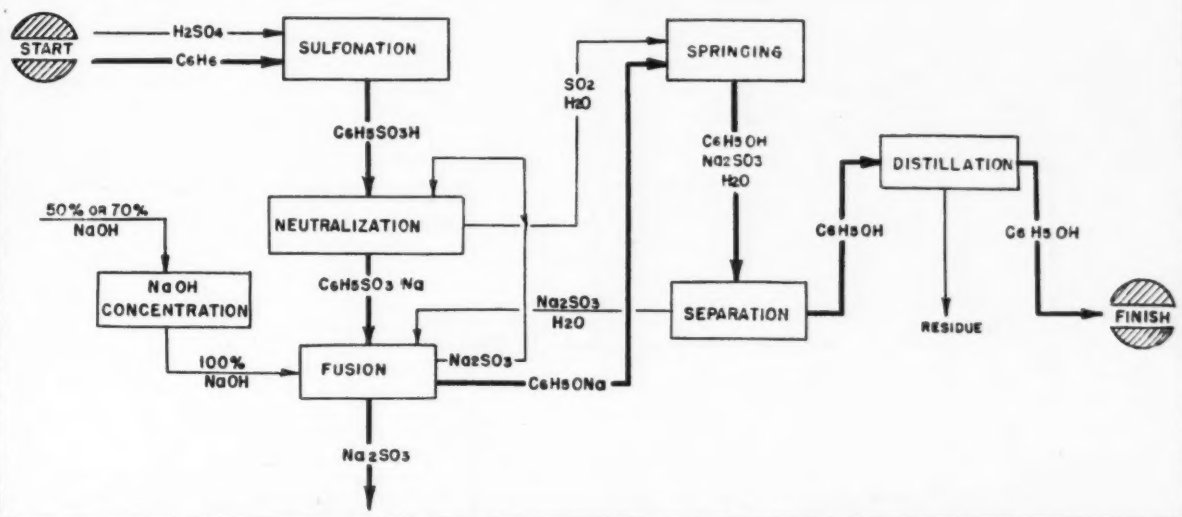
or overall reaction

$C_6H_6 + H_2SO_4 + 2NaOH \longrightarrow C_6H_5OH + Na_2SO_3 + 2H_2O$

The weak sodium phenate solution is concentrated by evaporation, and the sodium sulfite which precipitates upon concentration is recycled. Slurring within the reactor is said to produce a more concentrated phenate solution, reducing the evaporation load. Liberation of phenol from the sodium phenate solution can be accomplished by the introduction of an acidic gas such as sulfur dioxide, as mentioned above, or, as in the German practice, by carbon dioxide made by calcining limestone. If sulfur dioxide from the process is used as the springing gas, process interruptions usually require the addition of make-up SO_2 produced in a sulfur burner. When benzene sulfonic acid is fused directly, no acidic gas is produced in the process; hence, sulfuric acid is used for neutralization of the sodium phenate. The latter process results in use of an additional mol of caustic soda and ½ mol of sulfuric acid, and produces ½ mol of sodium sulfate.

FIG. 1

SYNTHETIC PHENOL BY THE SULFONATION PROCESS



After treatment with acid, the solution separates into a two-layer system, and crude phenol is decanted from the upper layer. The aqueous layer is recycled for dissolving the fusion mass. The crude phenol contains water, sulfones, and some diphenyl compounds, as well as phenolic polymers. It may be purified either by batch distillation or in a two-column continuous system. In the latter case, water is removed as distillate in the first column, pure phenol isolated as the distillate from the second column, and the residue drawn off from the bottom of the final tower. Close attention to materials of construction is required to prevent contamination of the phenol with color bodies and odor-bearing compounds. The use of stainless steel or nickel has been claimed to be advantageous. In the cost estimates shown in the following section, an overall yield of 90% of theory, based on the amount of benzene charges, has been assumed.

In the following comparison of the sulfonation process with other methods, the operation involving neutralization of the benzene sulfonic acid with sodium sulfite and springing with SO_2 has been adopted.

If direct fusion and sulfuric acid springing is used, the credit for sodium sulfate is about equal to the charge for extra acid and caustic. However, the fusion operation is not as efficient in terms of raw material requirements and the SO_2 springing procedure should be more economical. In practice, however, corrosion difficulties associated with handling SO_2 may more than offset the theoretical economies.

RASCHIG PROCESS

In recent years the Raschig process for conversion of benzene to phenol has been operated successfully in this country by Durez Plastics & Chemicals, Inc.[2,3,8] Work on the process began in Germany in an effort to avoid the problems of economic disposal of the by-products formed in the sulfonation and chlorbenzene routes. The method utilizes a modified Deacon reaction in which benzene, hydrochloric acid, and air are reacted in the vapor phase in the presence of a catalyst to form monochlorbenzene and water. Conversions per pass are only about 10% of the benzene charged to hold production of dichlorbenzenes to a minimum.

In the second phase of the process, the purified monochlorbenzene is catalytically hydrolyzed at high temperature to form phenol, at the same time generating hydrochloric acid. Thus, in theory, benzene is the only chemical raw material required. Actual practice has indicated that very small quantities of makeup acid and other chemicals are needed, also by-products must be limited to approximately six pounds of polychlorbenzene and two pounds of diphenyl compounds per 100 pounds of phenol. The diphenyl materials are formed during the hydrolysis step. Equations for the reactions are shown in Table 3.

The attached schematic flow chart (Fig. 3) illustrates the flow of the principal materials, and the steps required to complete the process cycles. It is seen that the recycle operations make the process more complicated than the simplified descriptions of the reactions would indicate. In the diagram the recycle benzene vapor stream is used as a starting point. The benzene is superheated, and mixed with hot air and hydrochloric acid vapors before passing through the first-stage converter. This unit produces a mixture containing benzene, chlorbenzene, small amounts of dichlorbenzenes plus residual hydrochloric acid and fixed gases. This mixture is separated by partial condensation and distillation operations which produce pure chlorbenzene for the second stage reaction.

The logical starting point for discussion of the second stage reaction is the introduction of the chlorbenzene and steam-vapor mixture to the heat exchangers and preheaters preceding the second-stage converters. The gases from this unit consist of a mixture of chlorbenzene, phenol, hydrochloric acid, and water. The acid is first removed by scrubbing with water in a tower which discharges the water azeotropes of chlorbenzene and phenol as an overhead product. The acid bottoms from the tower contain phenol, which is recovered by benzene extraction prior to recycling of the hydrochloric acid to the first-stage reaction. The chlorbenzene and phenol mixtures are separated in a tower which utilizes hot water as a scrubbing fluid, producing a water solution of phenol as the bottoms product. The chlorbenzene-water azeotrope vapors from the top of this unit are recycled to the reaction step. Phenol is recovered from the phenol-water solution by continuous counter current extraction with benzene. Make-up benezene, equivalent to the quantity of phenol produced is added at this point and utilized for this extraction. The resultant benzene-phenol mixture is then separated by distillation processes to recover benzene for recycle and to prepare the pure phenol product.

An overall yield of 92% of theory on benzene converted is believed to be representative.

FIG. 2

SYNTHETIC PHENOL BY THE CHLORBENZENE PROCESS

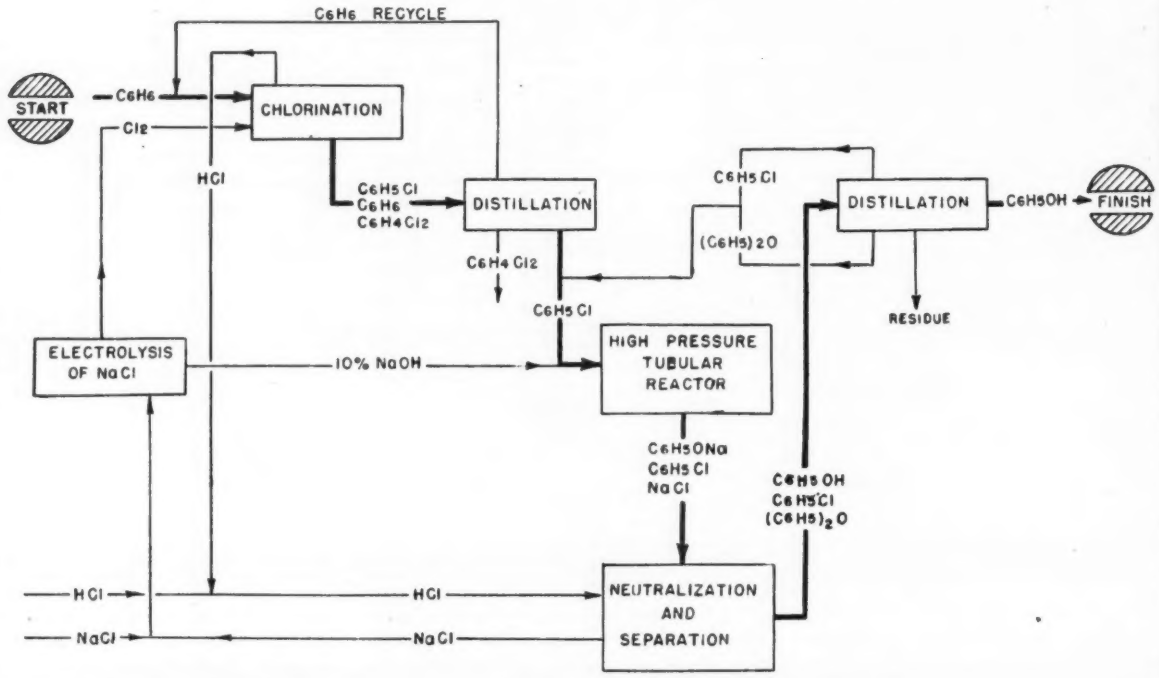


TABLE 2

Chlorbenzene Process for Synthetic Phenol

1. $2NaCl + 2H_2O \longrightarrow 2NaOH + Cl_2 + H_2$

2. $C_6H_6 + Cl_2 \longrightarrow C_6H_5Cl + HCl$

Benzene — Chlorbenzene

3. $C_6H_5Cl + 2NaOH \longrightarrow C_6H_5ONa + NaCl + H_2O$

Sodium Phenate

4. $C_6H_5ONa + HCl \longrightarrow C_6H_5OH + NaCl$

Phenol

or overall reaction

$C_6H_6 + H_2O \longrightarrow C_6H_5OH + H_2$

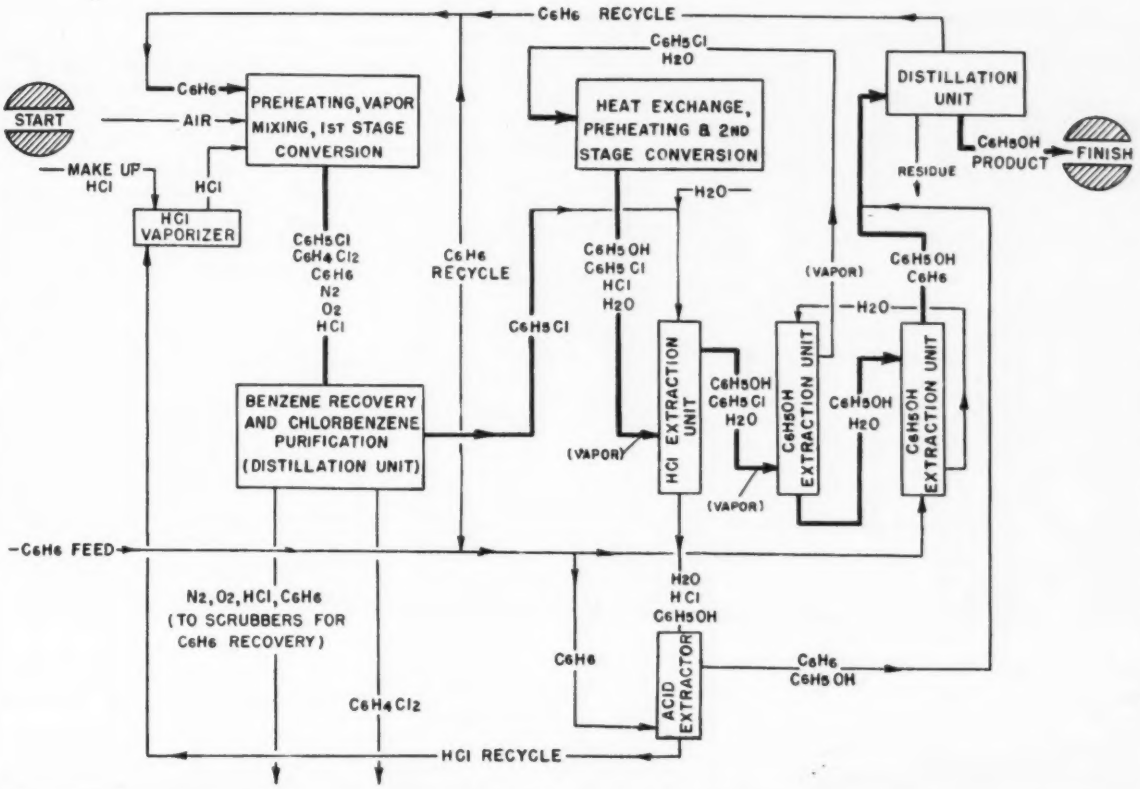
It is apparent from the description of the process that wet hydrochloric acid must be handled at several steps in the process, necessitating special materials of construction. Acidproof brick and glass linings have been used for towers and large processing vessels, while glass and porcelain are used in pipe and fittings. Where metal parts are required, Hastelloy B has been found to be serviceable. While the corrosion problem proved to be a very serious handicap in German operations, according to recent statements, difficulties from this source have been overcome in the Durez operations.

MANUFACTURING COSTS

In Table 4, the elements of production cost for the several processes are summarized. These estimates have been based upon published reports of American and German operations, supplemented by the authors' engineering knowledge of the processes. It is indicated that for the sulfonation and chlorbenzene routes, the process economy is closely related to the favorable sale of the by-product materials. The chief disadvantage of the sulfonation process is apparent from comparison of the raw material costs before by-product credit, which are indicated to be about 3¢ per pound of phenol for the Raschig or chlorbenzene methods and 6.8¢ per pound for the sulfonation process. In compiling these costs the prices used for benzene

FIG. 3

SYNTHETIC PHENOL BY THE RASCHIG PROCESS



and other raw materials are approximately equivalent to current market quotations, although it is probable that long-term contract prices are somewhat lower.

Since by-product selling prices are critical to the sulfonation process and important to the chlorbenzene process, markets for the by-products must be available to insure success by either route. Sodium sulfite from the sulfonation process finds its major outlet in the paper industry where it competes with sulfite solution made at the mill by burning sulfur, and subsequent absorption of the sulfur dioxide in lime water. The presence of 5-10% of sodium sulfate in the sulfite by-product constitutes a serious handicap to its sale. A price of 3¢ per pound for this material is probably optimistic despite the current 5¢ per pound trade quotation for the purified material.

Dichlorbenzenes are produced by the Raschig process as a crude material, and have been credited at 3¢ per pound as compared with the sales prices of 12.5¢ and 7¢ per pound for the para and ortho compounds respectively. The resultant 0.3¢ per pound reduction in phenol cost is not critical for this process.

Pure dichlorbenzenes and diphenyl oxide are the principal by-products of the chlorbenzene process. The largest producer by the chlorbenzene route, Dow Chemical, has developed attractive outlets for these products in its other manufacturing operations. The cost comparison of Table 4 includes an estimate for the chlorbenzene process operated so as to produce approximately 1.133 pounds of crude dichlorbenzene and 0.087 pounds of crude diphenyl oxide per pound of phenol. Crude dichlorbenzene has again been credited at 3¢ per pound. Diphenyl oxide is the major constituent (74%) of

TABLE 3

Raschig Process for Synthetic Phenol

1. $C_6H_6 + \frac{1}{2}O_2 + HCl \longrightarrow C_6H_5Cl + H_2O$

Benzene — Chlorbenzene

2. $C_6H_5Cl + H_2O \longrightarrow C_6H_5OH + HCl$

Phenol

or overall reaction

$C_6H_6 + \frac{1}{2}O_2 \longrightarrow C_6H_5OH$

Production Cost Comparison for Synthetic Phenol
Plant Capacity — 15 million pounds per year

Process	*Sulfonation*	*Raschig*	*Chlorbenzene With Production of By-Products**	*Chlorbenzene With Min. By-Products**
Plant Investment (at present cost)	$3,000,000	$3,500,000	$3,100,000	$3,100,000
Raw Material Costs (at present quoted prices)	2.49¢/lb.	2.44¢/lb.	3.00¢/lb.	2.43¢/lb.
Benzene @ 20¢/gal.	1.39	—	—	—
Sulfuric Acid @ 1¢/lb.	2.85	.04	—	—
Caustic Soda @ 2.5¢/lb.	.02	—	—	—
Sulfur @ 1¢/lb.	—	—	.15	.10
Rock Salt @ 1¢/lb.	—	.39	.01	.01
Hydrochloric acid (33%) @ 2.5¢/lb.	6.75¢/lb.	2.87¢/lb.	3.16¢/lb.	2.54¢/lb.
By-Product Credits (for crude materials)				
Sodium sulfite @ 3¢/lb.	4.02	—	—	—
Crude Dichlorbenzene @ 3¢/lb.	—	.30	.40	.13
Phenol Residues @ 3¢/lb.	—	.06	.05	—
Diphenyl oxide @ 10¢/lb.	—	—	.87	—
	4.02	.36	1.32	.13
Net Material Cost	2.73	2.51	1.84	2.41
Labor @ $1.75/hr.	.72	.61	.67	.61
Utilities**	1.05	1.18	1.35	1.24
Maintenance	1.60	1.16	1.03	1.03
Taxes, Ins., & Fixed Charges	1.00	1.16	1.03	1.03
Overhead & Supervision	.36	.30	.31	.31
Total Production Cost ex depreciation	7.45	6.92	6.24	6.63
Depreciation at 10%/yr.	2.00	2.32	2.06	2.06
Total Production Cost (exclusive of sales expense, etc.)	9.45¢/lb.	9.24¢/lb.	8.30¢/lb.	8.69¢/lb.

**Polychlorbenzene, diphenyl compounds*

***Utilities Cost*
Power (for misc. equipment)—$0.01/*KWH*
Power (for electrolysis)—$0.005/*KWH*

Cooling water—$0.03/1,000 *gals.*
Steam—$0.55/1,000 *lbs.*
Fuel—$0.1/*million BTU*

Dowtherm A, which is its major outlet; Dowtherm sells for 19¢ per pound. Perfume grade diphenyl oxide is quoted at 45¢ per pound but this use is believed to be small. While it is difficult to arrive at an accurate credit figure for the oxide in the crude state, about 10¢ per pound should be in the proper range. On this basis, the somewhat higher benzene and processing costs for the chlorbenzene process (with by-product production) are offset by the by-products credits, and net materials cost is reduced to about 1.7¢ per pound of phenol.

In the chlorbenzene process as operated by General Electric, full advantage is taken of the opportunity to reduce by-product formation. The net materials cost of about 2.4¢ per pound for this process is lower than for the Raschig process, and it is less dependent on credit for the by-product dichlorbenzenes and diphenyl compounds.

Labor costs do not differ materially among the processes, although they are highest for the sulfonation method. Continuous processesing is utilized to better advantage in the Raschig and chlorbenzene processes, but the complexity of the former, and the added step of brine electrolysis in the latter do not permit substantial labor economies. Utility changes are highest for the chlorbenzene process chiefly because of the charge for power for electrolysis (at 5 mil per) amounting to 0.5¢ per pound phenol. Fuel cost is highest in the sulfonation process because of the requirements for caustic concentration and fusion. Use of 70% caustic soda averts the fuel requirements for production of the anhydrous product. The low conversions and consequent high distillation load make the Raschig process the largest steam consumer.

Plant investment figures have been difficult to compile because of the scarcity of data and the rapidly changing costs of new construction. Therefore the figures listed are approximate and indicate only the relative orders of magnitude. The Raschig process is generally recognized as requiring the highest investment because of the size and number of processing units, and the materials of construction. In spite of the high pressures required, the basic chlorbenzene process equipment is relatively simple and inexpensive. However, addition of electrolytic equipment for conversion of recycled brine to caustic and chlorine makes the investment roughly equivalent to that for the sulfonation process. The investment for the chlorbenzene process should rise more slowly than for the other methods with an increase in plant capacity, and at an annual production near 100 million pounds it should be significantly lower.

Maintenance has been charged at 5% per year on investment except by the sulfonation route, where an 8% figure has been used because of the serious corrosion problems arising from handling of sulfur dioxide. Taxes and insurance have been calculated at 5% per year on the investment. The plants have been amortized over a ten-year period, although it is recognized that a margin which would not permit payout in 3 to 5 years should be considered unattractive to anyone considering the construction of a plant.

On a 15,000,000 pound-per-year production basis the cost of production of phenol by the chlorbenzene process as operated by General Electric (minimum by-products) is estimated to be 8.7¢/pound. This compares with an estimated 8.3¢/lb. cost for the chlorbenzene–by-product–route although this latter figure is contingent upon substantial by-product credits for dichlorbenzene and dihpenyl oxide. The chlorbenzene-by-product process hence, is probably not attractive to a producer who has no control over the prices of these materials. At 9.2¢ per pound of phenol, the Raschig process is not at a serious disadvantage, and the choice between it and the chlorbenzene route is essentially dependent on unit costs in the location under consideration. The price of power for electrolysis is of major importance from this standpoint. The cost shown on the table for the sulfonation process, or 9.5¢ per pound, must be considered optimistic since a substantial credit for by-product sodium sulfite has been included and a minimum of operating difficulties have been considered. However, if a market for sodium sulfite (and sulfate) exists and the plant is carefully designed and operated, the sulfonation process will continue to be competitive. When consideration is given to plants with a capacity near 100 million pounds of phenol per year, costs will undoubtedly favor the chlorbenzene process because of the substantially smaller investment required.

REPRINTS

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THE CHEMICAL PANORAMA

NEWS OF THE CHEMICAL PROCESS INDUSTRIES IN PICTURES

PEOPLE

Harold F. Smiddy, appointed general manager of the Chemical Department, General Electric Co.

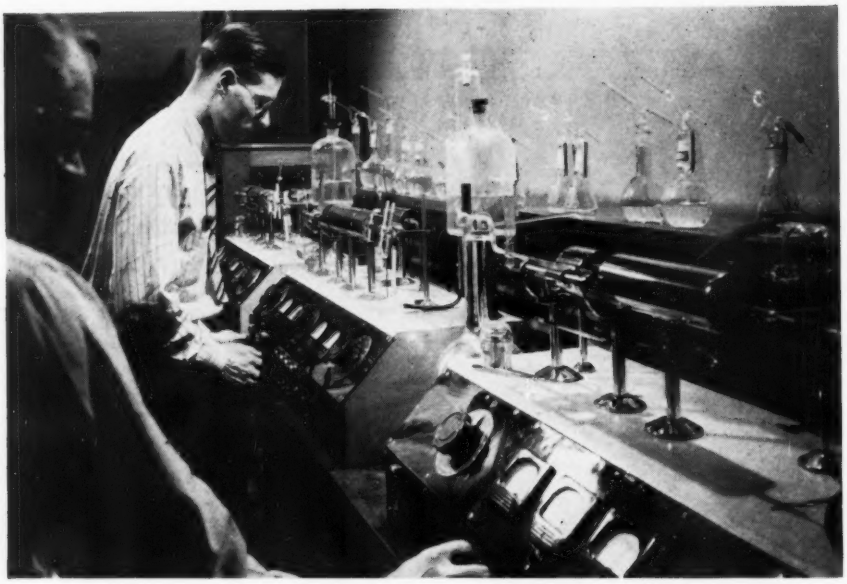
Eldon E. Stahly, named director of chemical research for the Commercial Solvents Corp.

Arnold H. Smith, elected president of Monsanto (Canada), Ltd., on Montreal.

John T. Masterson and Charles W. Frost (top), elected vice-presidents of Prior Chemical Corp. Both have been division sales managers.

Maurice H. Lockwood, (left), new vice-president of International Minerals & Chemical Corp., and Henry B. Baylor, who is retiring from the position after 35 years of service.

Gulf Oil

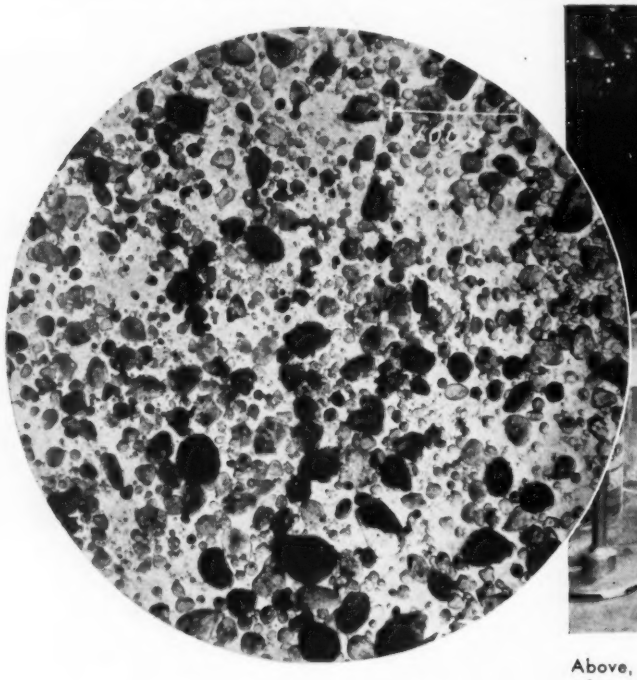


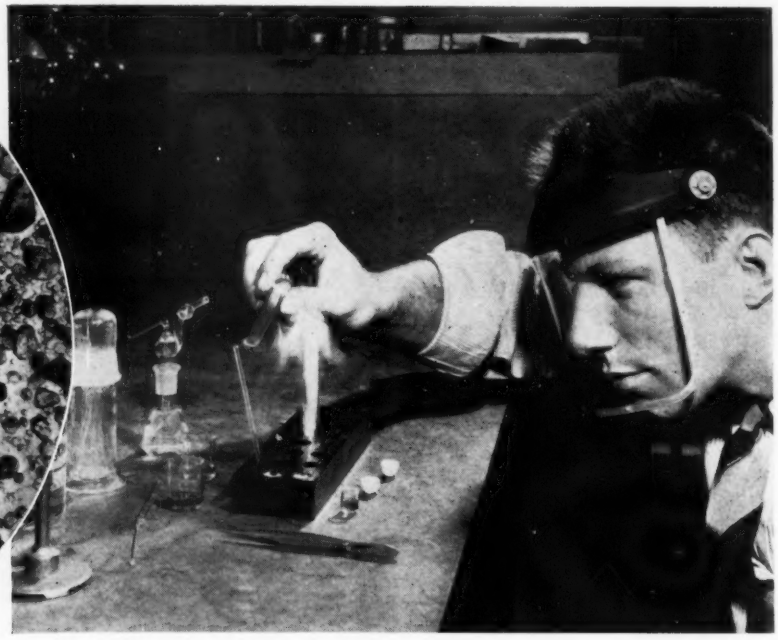
A battery of miniature, automatic, electrical furnaces. These move at varying rates along combustion tubes and may be set for desired cycles, leaving research workers free.

Gulf Oil Corp. now has a "doll-house" laboratory, a chemical workshop in miniature. Here microscopic instruments permit scientists to work with quantities of material ten to hundreds of thousands of times smaller than those ordinarily used in research. These smaller samples can be analyzed much more quickly than normal amounts.

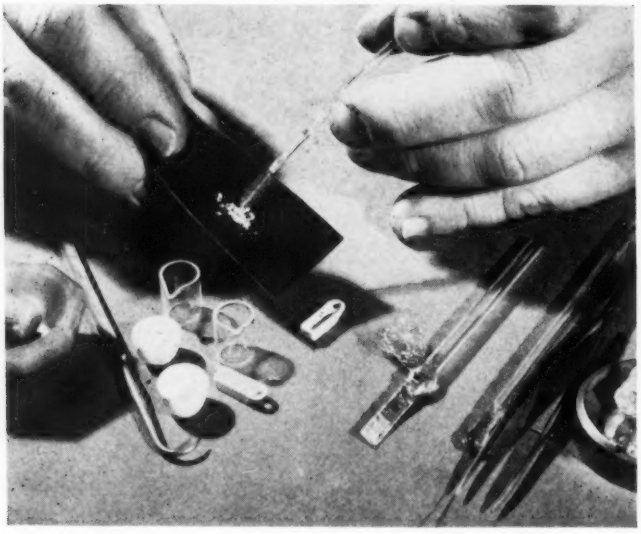
Other micro-lab advantages are the conservation of expensive and scarce chemical materials, saving of laboratory space, and ability to study substances so small as to defy analysis. A unique safety feature is that highly explosive materials may be experimented with on such a reduced scale that serious dangers are eliminated.

Quantities of solution dealt with are sometimes so small that they must be kept in transparent, humidified cells, since exposure to air would cause instant evaporation of the entire sample.





Above, a micro-explosion jars a test tube. Left, a typical catalyst through a microscopic lens, magnified 500 times. Note space marked "100 μ", 1/250th inch.



Instead of a brush, a feather on a glass rod sweeps a few grains of sample (here a petroleum inhibitor) into a combustion boat.

A "boat" containing a sample of catalyst used in oil refining is charged into a miniature micro-laboratory furnace for analysis.

Micro Lab

The portable laboratory, designed for "spot tests" in the field. The "spot tests" permit immediate and accurate identification of many complex materials.

A polaragraph, a device which permits actual analyses in 10 minutes which otherwise might require hours.

Wyandotte Research Staff Meeting

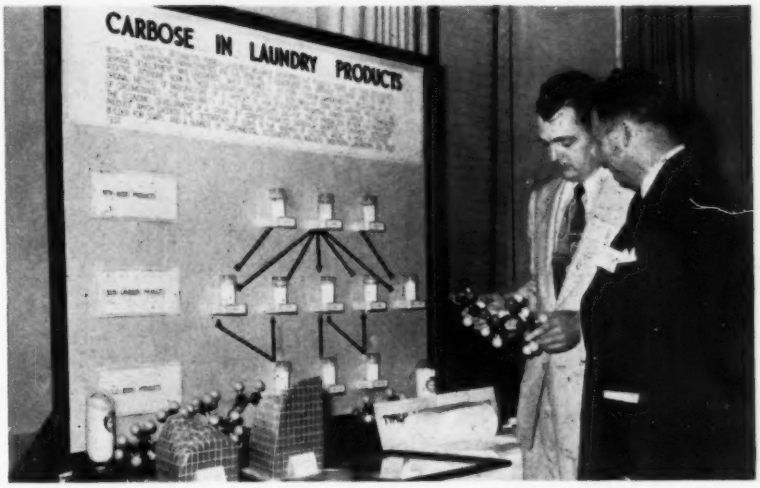
The third annual staff meeting of the Wyandotte Chemicals Corporation Research Department, recently held at the Hotel Statler, in Detroit, was arranged in trade convention style. Nineteen exhibits, depicting various phases of the company's activities, were featured.

Among the exhibits were a sonic modulus tester, built by the Research Department, a plastic flow diagram which showed with colored lights the basic steps in manufacturing Wyandotte glycols and derivatives, and staff-produced work on the application of physical methods to the solution of chemical problems.

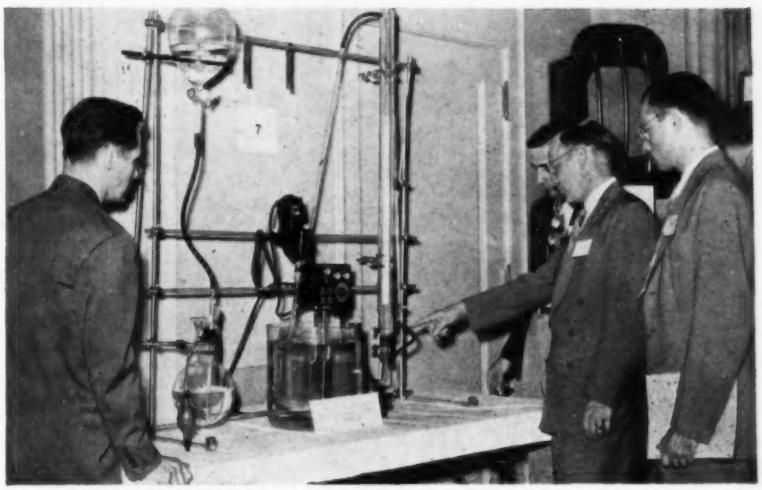
There was also a display demonstrating the use of radioactive materials as tracers in detergency studies, and several of the exhibits detailed the use of Carbose (a technical grade of sodium carboxymethyl cellulose) and Kreelon (alkyl aryl sulfonate) in new laundry detergents.

Dr. Thomas H. Vaughn, vice-president in charge of research, explained that the first phase of Wyandotte's long-range research program, entry into the organic field, has been completed. The company is now embarking upon the second phase, the utilization of the new products resulting from phase one of its expansion program.

Some of the other speakers at the one-day meeting were E. M. Ford, president of Wyandotte, W. F. Torrey, senior vice-president, and Ford Ballantyne, Jr., assistant vice-president.



C. E. Smith, head of laundry and textile research, discusses molecular configuration and properties of sodium carboxymethyl cellulose with a sales executive.



Representatives from various Wyandotte departments examine apparatus assembled for the measurement of the foaming characteristics of detergents.

Ringers, but not enthusiastic rooters, were at a premium when the members of the association, between technical sessions, took to the lawn of the Monmouth for the quoit tournament.

C. A. Lawrence, Winthrop-Stearns (l.) and G. Goetchius, Rohm & Haas, eye quoit peg.

NAIDM Meets

About 260 representatives of some 135 companies made insecticides the main topic at the 34th mid-year meeting of the National Association of Insecticide and Disinfectant Manufacturers, held at the Monmouth Hotel, Spring Lake, N. J., June 14-16. Speakers from industry, colleges and governmental agencies presented a variety of matters of broad interest in general morning discussions, while committees and small groups made specific problems of the industry their concern in afternoon sessions. Those not involved in such business found the golf course or the quoit pits satisfactory substitutes for meeting rooms. All put aside concern over the ailing insecticide business at the banquet which closed the convention.

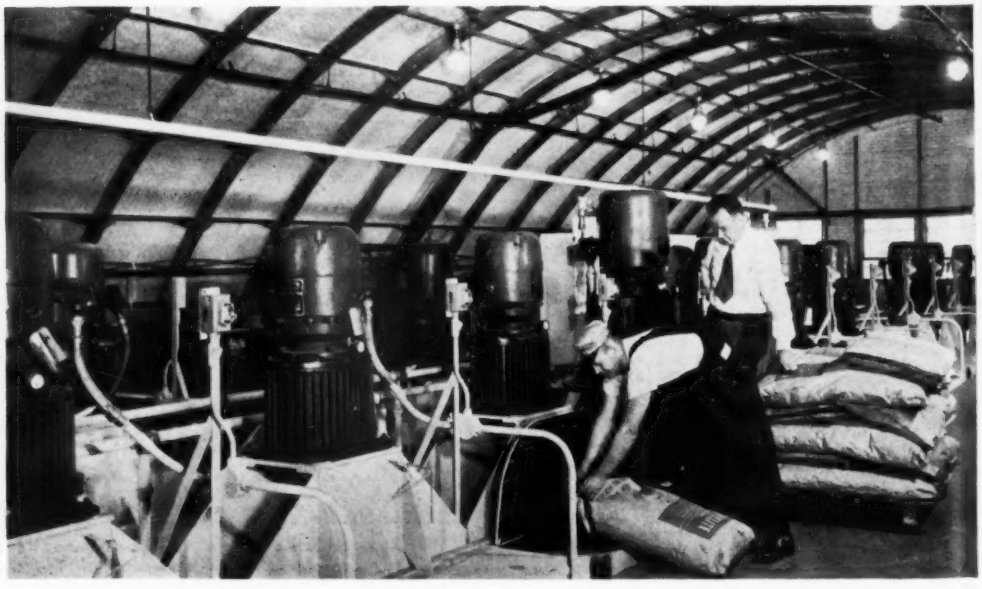
F. Thompson, Jr., R. J. Prentiss (l.); R. L. Stevenson, Givaudan-Delawanna; and A. R. Calo, John H. Calo, pause before teeing off.

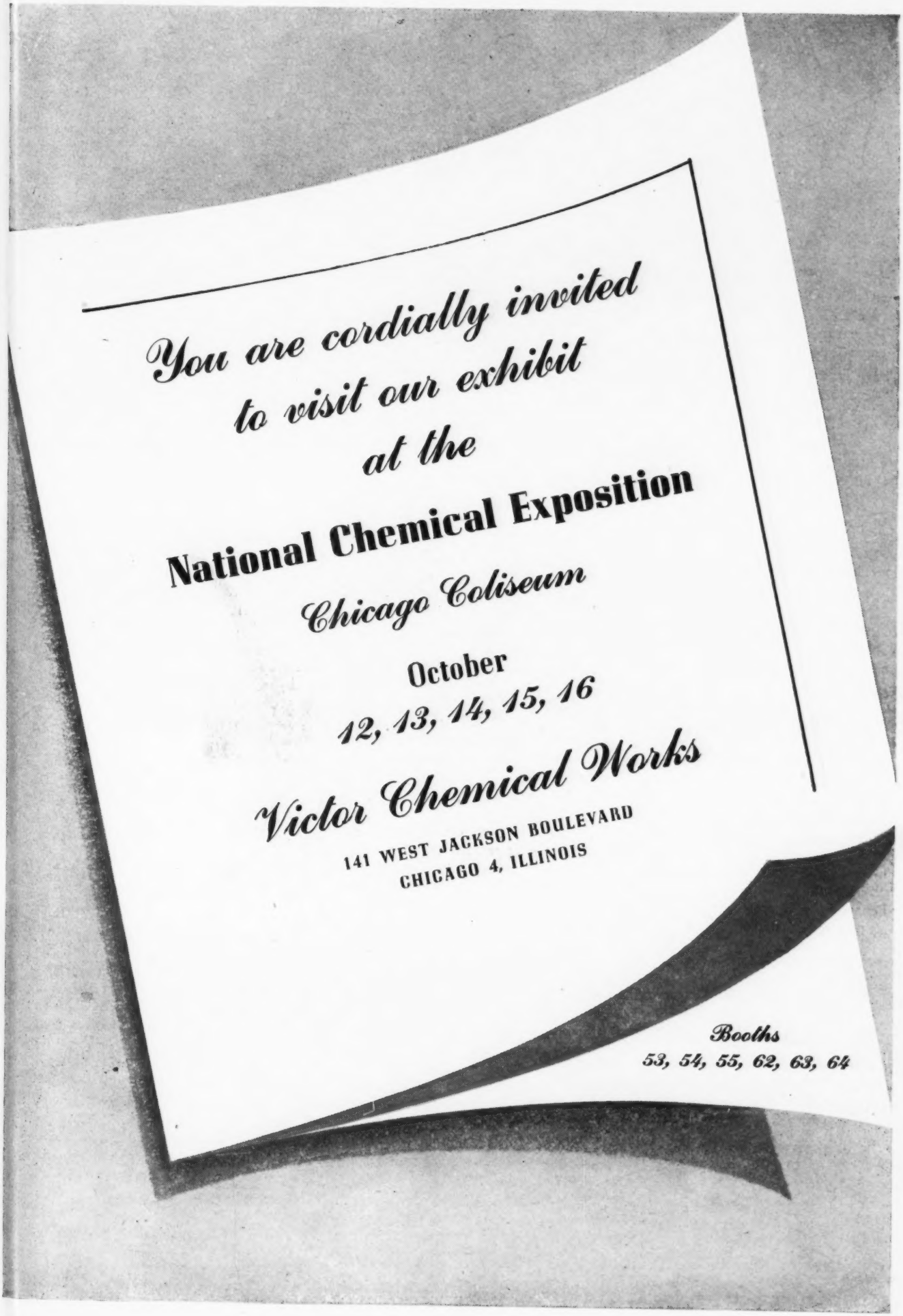
J. Weiner, Standard Container, and W. J. Weed, Niagara Alkali, stand on the edge of the tenth green after successfully holing out.

New Use for Quonsets

Twenty-two large explosion-proof mixing tanks are now in operation at the Arco Co.'s new lacquer plant, completed shortly after a fire which destroyed the previous plant. The unit comprises five Quonset-type buildings, and has a reinforced concrete mezzanine which extends along their full length. This simplifies charging of tanks.

The plant has been equipped throughout with explosion-proof fixtures, and is insulated with a fire-resistant combination of rock wool and asbestos.

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Booths
53, 54, 55, 62, 63, 64

NEW PRODUCTS & PROCESSES

Vinyl Ethers NP 715

Five new vinyl ethers are being produced by Carbide and Carbon Chemicals Corp. in addition to the three that have been in commercial production. The eight compounds now include vinyl methyl, ethyl, isopropyl, n-butyl, isobutyl, 2-methoxyethyl, 2-chlorethyl, and 2-ethylhexyl ether.

These vinyl ethers can be polymerized in either the liquid or vapor phase. With other monomers, copolymers are obtained. Vinyl ether polymers and copolymers vary from hard resins to soft, internally plasticized compounds, valuable for coatings, films, and molding and casting resins.

With the hydroxyl groups of cellulose and other polyhydroxy compounds, the vinyl ethers react to yield mixed acetals having good water and alkali resistance. The vinyl ethers are also intermediates for such products as methyl ethyl pyridine, 1,2-dichloroethyl alkyl ethers, and 2-alkoxy propionitrile.

Benzyl Dimethlylamine NP 716

The availability of pilot-plant quantities of benzyl dimethylamine has been made known by the Rohm & Hass Co. Raw materials and equipment are available to manufacture this product on a commercial scale as soon as a sufficient market is indicated.

Benzyl dimethylamine has a boiling point of 180-182°C at atmospheric pressure, a specific gravity of 0.9068, and is soluble in water to the extent of only 1.098%. It is being supplied with a purity of 95-96%.

Benzyl dimethylamine reacts with organic halides to produce quaternary ammonium compounds, and appears to have a reactivity about equivalent to that of pyridine.

While the greatest interest in benzyl dimethylamine is probably as an intermediate for quaternary ammonium compounds, it may also be useful as a dehydrohalogenating catalyst, acid neutralizer, corrosion inhibitor, and in other applications requiring a relatively high-boiling tertiary amine.

Rubber Accelerator NP 717

The commercial production of Goodrite Erie rubber accelerator in a new pelletized form has been started by B. F. Goodrich Chemical Co. Formerly supplied as a rubber-soluble liquid, the product is now available in dustless, free-flowing black pellet form containing 50% active agent absorbed on easy processed carbon black.

Tanning Agent NP 718

Synthetic tanning agents which give soft yet strong leathers that can be repeatedly washed or dry cleaned were developed recently by the Du Pont Co. In contrast with leathers tanned by other methods, gentle flexing and stretching are all that is needed to restore the leather to its original softness. These new tanning agents, known technically as aliphatic hydrocarbon sulfonyl chlorides and sold under the trade-mark Skelt, contain a softener which becomes an integral part of the finished leather.

The sulfonyl chlorides are particularly well adapted as tanning agents for white leather. This new process is currently applicable to white and colored glove leathers, furs, and some garment leathers, as well as chamois.

These new synthetic tanning agents are made by treating a petroleum oil with a gaseous mixture of sulfur dioxide and chlorine, using light of a suitable wave length as a catalyst to speed up the reaction.

In general, tanning with sulfonyl chlorides is a simple operation, consisting essentially of drumming the skins with an aqueous emulsion of the synthetic tanning agent in the presence of a small amount of sodium carbonate, and drying at about 110° F. The tanned leather is then worked up in very much the same way as when conventional tanning agents are employed. The new process requires a drying or "crusting" period, not necessary when conventional methods are employed, to bring about complete tannage.

Fat Stabilizer NP 719

Two new antioxidants, Tenox HQ and Tenox BHA, are being made by the Tennessee Eastman Corp. Added to fats and oils during processing, very small percentages of Tenox HQ and Tenox BHA combat effectively the commonest type of rancidity, which is caused by the action of oxygen in the atmosphere. Indications are that these compounds will stabilize fats and oils for almost every edible use, throughout the normal time of processing, distribution, and consumption. Toxicity tests have shown them to be safe for human consumption, when used in the prescribed proportions. They do not impair the nutritional value of food, and are economical to use.

Tenox HQ, a highly purified form of hydroquinone, is an effective stabilizer for salad oils, cooking oils, margarine, peanut butter, orange and lemon oil extracts, and dried milk. It is applicable to vitamin A oils, preventing loss of available vitamin A during storage.

Tenox BHA, butylated hydroxyanisole, is of special value in stabilizing animal fats, particularly lard. Investigations by the American Meat Institute have shown

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Please send me more information, if available, on the following items. I understand that nothing further may be available on some of them.

NP 715	NP 719	NP 723	NP 727	NP 732
NP 716	NP 720	NP 724	NP 728	NP 733
NP 717	NP 721	NP 725	NP 729	NP 734
NP 718	NP 722	NP 726	NP 730	NP 735
			NP 731	NP 736

(Please print)

Name..... (Position).....

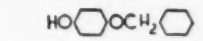
Company.....

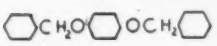
Street.....

City..... Zone..... State.....

Good-rite CHEMICALS

Ethers of Hydroquinone


Monobenzyl Ether of Hydroquinone

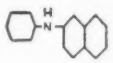

Dibenzyl Ether of Hydroquinone

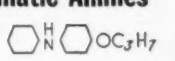
Monobenzyl ether of hydroquinone may be used as an antioxidant, stabilizer, or plasticizer in pharmaceuticals, paints, varnishes, and organic synthesis.

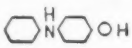
Dibenzyl ether of hydroquinone may be used as a high boiling solvent for perfumes, cosmetics, pharmaceuticals, plasticizers, paints, varnishes, and organic synthesis.

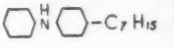
Other organic chemicals

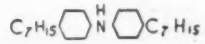
Secondary Aromatic Amines


Phenyl B-Naphthylamine

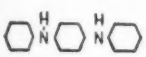

p-Isopropoxy Diphenylamine

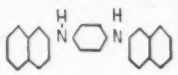

p-Hydroxy Diphenylamine


Mixed Mono and Diheptyl Diphenylamines

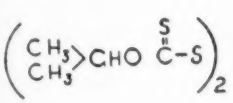


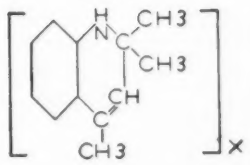
Di-secondary Aromatic Amines

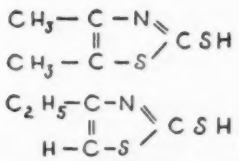

Diphenyl p-Phenylenediamine


Di B-Naphthyl p-Phenylenediamine

Miscellaneous


Di-Isopropyl Dixanthogen


Trimethyl Dihydro Quinoline Polymer


Mixed Ethyl and Dimethyl Mercaptothiazoles

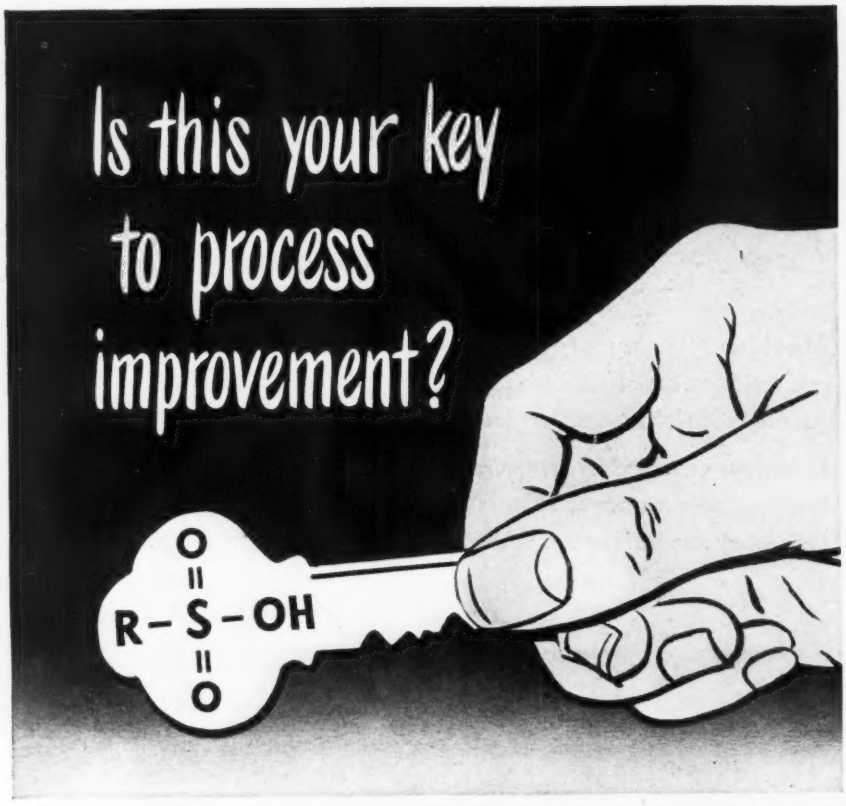
N-Nitroso Diphenylamine

All materials listed here are available in commercial quantities. Prices and technical information are available on request. Please write Dept. CE-8, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio.

B. F. Goodrich Chemical Company

A DIVISION OF THE B. F. GOODRICH COMPANY

GEON polyvinyl materials • HYCAR American rubber • KRISTON thermosetting resins • GOOD-RITE chemicals



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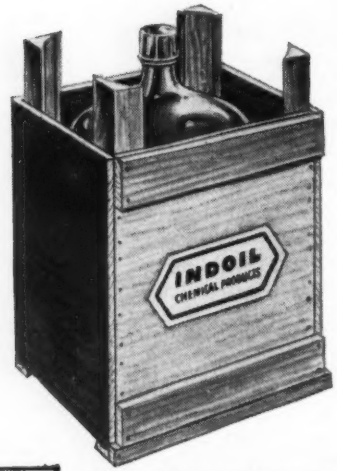
. . . are strong, non-oxidizing liquid acids, miscible with water, soluble in many organic liquids, and are solvents for many complex high-molecular-weight organic compounds. They are unusually effective catalysts for esterification, polymerization, condensation, alkylation, and other organic reactions. The metal salts of the acids, including those of barium and lead, are highly water-soluble. They are of demonstrated interest in the rapid electrodeposition of metals. Varied commercial applications of the acids and salts have been developed and many others are indicated.



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MIXED ALKANE SULFONIC ACID
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Available for limited commercial use.

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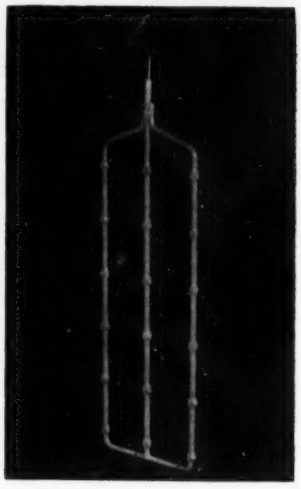
that a combination of Tenox BHA and Tenox HQ, plus a synergist such as citric acid, provides an adequate answer to the stabilization of lard for all uses, including deep-fat frying of potato chips, doughnuts, and the baking of crackers or pastry.

Plating-Rack Coating NP 720

Enthone, Inc. has developed a new liquid plastic plating-rack coating called Enthonite 101. This chemically resistant material is supplied as a viscous liquid containing 100% solids, which is applied by dipping to produce coatings varying



in thickness from ⅛" to ¼". The material is applied over a primer coat and is baked at temperatures of 350° F. or higher for a short period of time.

No loss is experienced with the use of this material because there are no solvents to evaporate and all drippings can be reclaimed and used. The coatings produced are stated to have very high resistance to all types of inorganic solutions, particularly plating solutions including chromium plating solutions. The surface produced is glossy so that solutions do not readily wet it and considerable saving and dragout of solution is claimed. The coatings produced are tough and resilient and will not chip even on rough abuse.

Ethylene Glycol Dimethyl Ether NP 721

Ethylene glycol dimethyl ether is a medium-boiling ether with a wide range of solvent power, miscible in all proportions with both hydrocarbons and water. This unusual combination of properties suggests many uses both in the laboratory and the plant. As a general solvent this ether shows a remarkable versatility since the degree of solvent power may be greatly altered by proper dilution with water or with any of the common organic solvents. The boiling point of 85.2° C. is low enough to allow the solvent to be

You'd reclaim this...

Why not your waste process liquors?

With certain chemicals in as short supply as new automobiles, many process industries have found it necessary to "clean up" their valuable process liquors so that they may be reused indefinitely. Purification by adsorption with Nuchar Activated Carbon has proved to be the answer, not only because the carbon cost is low, but also, because little or no additional plant equipment is required.

For instance, in a certain dyeing process, the dye liquor is prepared with a mixture of acetic and formic acids. After treating the fabric the residual liquor contains sufficient color to prevent reuse of the acetic and formic acids.

One concern has installed a reclamation process whereby activated carbon removes the color from the solution so that the acetic and formic acids can be reused. The proportion of Nuchar Activated Carbon required is usually quite small and it is reported that $400.00 worth of the acids are reclaimed at an activated carbon cost of $1.00.

Perhaps we have the answer to your purification problem right in our extensive technical files. A request written to our nearest office will place Nuchar's thirty years of activated carbon research at your service.

Snow Top Precipitated Calcium Carbonate—Nuchar Activated Carbons—Liqro Crude Tall Oil—Indusoil Distilled Tall Oil—Tallene Tall Oil Pitch—Tallex Abietic Acid—Sulfate Wood Turpentine—Alpha Pinene—Beta Pinene—Polycel Cellulose Fibers—Indulin (Lignin)

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OF the thousands of finished products stemming from the petroleum industry, a majority have odors that are strong and not infrequently of a character inappropriate to their intended use. Properly treated, however, these odors can be pleasantly modified or effectively eliminated . . . and at a cost so small as to be negligible. Our widely used NEUTROLEUM series —one of the most economical and best all-around neutralizing compounds ever developed—was an outgrowth of experiments conducted by our laboratories for this industry.

PERHAPS WE CAN DO IT FOR YOU! . . .

Your industry may be tolerating odors no more difficult to modify than those which plagued the oil industry for many years. Like theirs, your products may retain unpleasant residual odors. Or certain of your processing operations may be producing conditions unfavorable to the health or efficiency of your plant personnel. In any case, it may be worth your while to place your problem before us . . . let our odor specialists study it and report back whether or not they can offer you a practical and economical solution. It will obligate you in no way to let us try.

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FACTORY: *Clifton, N. J.*

readily removed from finished preparations and is at the same time high enough for convenient handling.

A few suggested uses for ethylene glycol dimethyl ether are: as a general reaction medium, particularly for the preparation of organometallics; as a solvent for recrystallizations; as a spectrophotometric solvent; as a substitute for ethyl ether in most applications where the very high vapor pressure of ethyl ether constitutes a hazard. The property of miscibility with both oil and water should make this solvent of particular interest as a blending agent in emulsion formulations.

Ethylene glycol dimethyl ether, in common with other ethers, is subject to peroxide formation on exposure to air. It is, therefore, recommended that the solvent be tested and any peroxides destroyed before distilling. This product is available from Arapahoe Chemicals, Inc.

p-Chlorobenzotrifluoride NP 722

p-Chlorobenzotrifluoride (*p*-chlorotrifluoromethylbenzene) has recently been introduced in pilot plant quantities by the Hooker Electrochemical Co. The compound is of interest for its potential applications as an intermediate in the preparation of various chemicals and dyestuffs, as well as for possible use as a special solvent and dielectric fluid.

p-Chlorobenzotrifluoride is a colorless aromatic liquid which is characterized by the CF_3 group. This radical is generally stable to light, heat and chemical reaction. Its distillation range is 138° to 141.5°C; freezing point is −36°C; and its specific gravity at 15.5°C is 1.353.

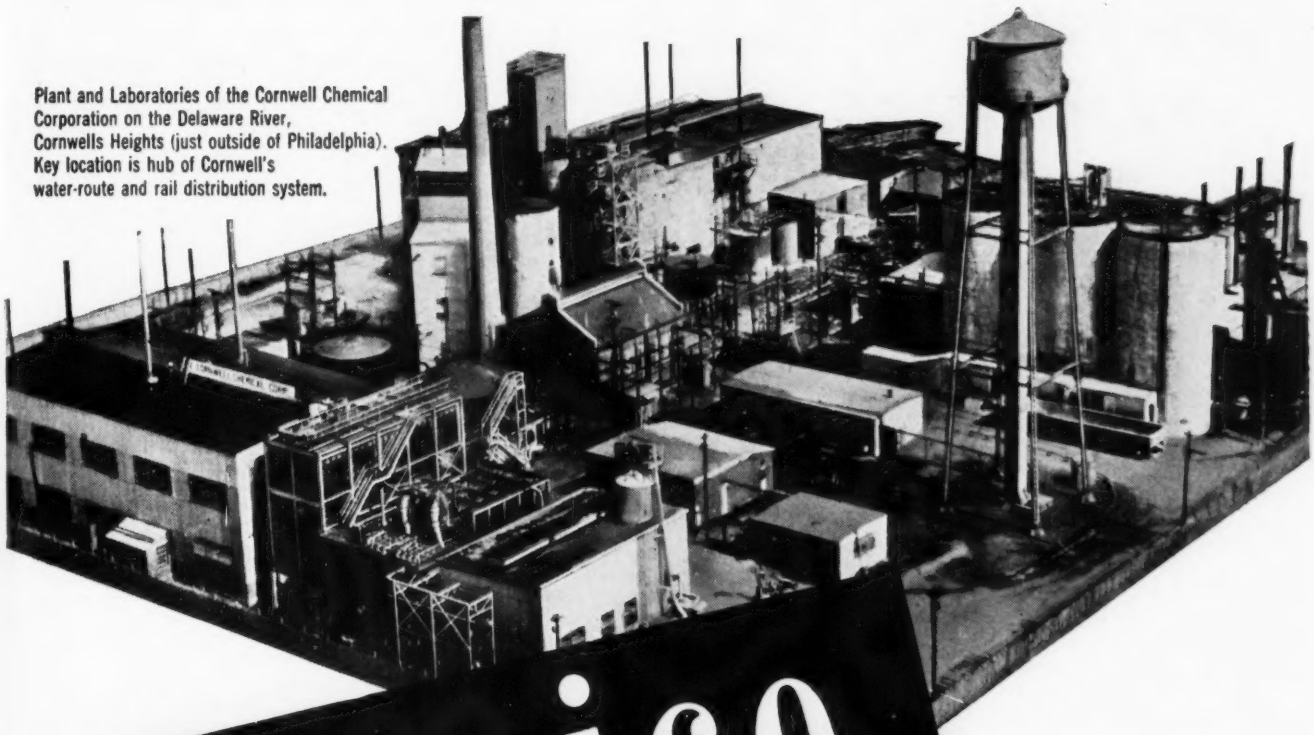
Blue Pigment NP 723

Production in commercial quantities of a new iron blue pigment called Alkiron Blue which posses resistance to alkalis—remarkable for iron blues—has been iniated by Ansbacher-Siegle Corp. Described as being superior to the usual iron blues in jetness of masstone, durability and resistance to attack by chemical agencies, the color is designed for use in the paint, enamel and lacquer industry.

The color which is stable to light and has high alkali resistance will stand up under daily washing with the usual detergents.

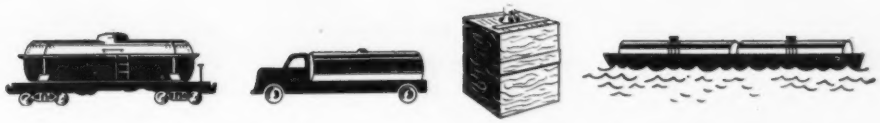
Air-Drying Coating Needs No Primer NP 724

Easier application, without primer, increased corrosion-resistance efficiency, and durability are among the features of LC-600, a new coating made by Lithgrow Corp. It is for use in tanks, fermenters, carbonated beverage equipment, driers, pipe fittings, filter bodies, bottling equipment, etc. in pharmaceutical, food prod-



Plant and Laboratories of the Cornwell Chemical Corporation on the Delaware River, Cornwells Heights (just outside of Philadelphia). Key location is hub of Cornwell's water-route and rail distribution system.

service



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MURIATIC ACID
18° 20° 22°

NITRIC ACID
36° 38° 40° 42°

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White, insoluble, extremely inert oxide with a high melting point. Contains approximately 85% ZrO_2.

HYDRATED ZIRCONIA
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White gel containing 50% solids. Of the solids, approximately 85% is ZrO_2.

SODIUM ZIRCONYL SULFATE
(TECHNICAL)

White, granular, water soluble, non-hygroscopic solid containing approximately 33% ZrO_2.

ZIRCONYL SULFATE SOLUTION
(TECHNICAL)

A water solution containing approximately 12% ZrO_2.

USES: These compounds are interesting starting materials for the preparation of catalysts and a variety of zirconium derivatives. ZIRCONIUM COMPOUNDS have been found to be useful as protein hardeners, water repellents, refractories, and vitreous enamel opacifiers.

ROHM & HAAS has made many other zirconium compounds in the laboratory and pilot plant that might be of value for special applications.

Write to Dept. S. P. for samples, outlining your problem.

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It may be sprayed, dipped, flowed, roller coated, or brushed on almost any clean unpolished, de-rusted surface; and it is resistant to acids, alkalies, chlorides, oils, salts, oxygen and alcohol solutions.

Vitamin E NP725

A new vitamin E product, introduced by Distillation Products, Inc., is the first alpha-tocopheryl acetate concentrate to be commercially prepared from vegetable oils. Each gram of the solution contains 250 milligrams of *d*-alpha-tocopheryl acetate. The company's bioassays indicate a biological activity equivalent to about 340 international units of vitamin E per gram of concentrate. Designated "Type VI Vitamin E Concentrate," the product is priced at $62.50 per kilogram which is about 1.84 cents per hundred international units, or approximately 29% below the cost of previous concentrates on the basis of its vitamin E activity. It is available for immediate shipment.

Phosphate Type Plasticizer NP726

A new vinyl plasticizer of the phosphate type, known as Santicizer 141, has been specifically designed by Monsanto Chemical Co. as a primary plasticizer for polyvinyl chloride and polyvinyl acetate film, sheet or molded articles.

The new plasticizer is compatible with a wide variety of resins, in addition to polyvinyl chloride. These include cellulose nitrate, cellulose acetate-butyrate, ethyl cellulose, polymethyl methacrylate, polystyrene and polyvinyl butyral resins. In polyvinyl chloride, Santicizer 141 possesses low volatility and imparts good low-temperature flexibility, excellent solvent resistance, and flame retardance.

Santicizer 141 is free of any systemic toxicity and is non-irritating to human beings.

Cleaning Solvent Booster NP727

A new, liquid, aromatic concentrate is made by The Curran Corp.

The new solvent is especially adapted for use in recirculating solvent cleaning machines for degreasing automotive parts, etc., since it may be added to common, ordinary mineral spirits Commercial Standard CS-3-38 (Stoddard solvent)—available at very low cost at all major oil company bulk plants—and it is stated the addition of 5 gallons of the new aromatic concentrate to a 50-gallon drum of mineral spirits results in bumping up the solvency of the mineral spirits to such an extent that the low-cost mineral spirits becomes a powerful, highly penetrating mobile solvent with a quick, clean rate

Great Day for Grandma

Even back in the '90's . . . when the folks went to meeting in the family buggy . . . Esso Standard Oil Company had already begun its experiments on light fraction petroleum refining—from which has developed Esso Petroleum Solvents.

SINCE THEN, the demand for Esso Solvents has grown tremendously . . . and today they're to be found meeting many needs in the automotive, textile, paint, food and rubber industries, as well as in hundreds of others.

From the gleaming finish of modern automobiles, to coated fabrics and plastic fittings . . . the answer to many industrial problems is found in Esso Solvents.

Whatever *your* solvents needs may be, you can be sure of high-quality *uniformity* and *stability* — when you use Esso Petroleum Solvents!

FOR HELP on *any* solvents problems you may have . . . call on your Esso Solvents sales representative.

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Free of arsenic, selenium and tellurium

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of evaporation. It is non-polar. It is also claimed that the new solvent may be safely handled without personnel hazard or danger of flammability.

Pharmaceutical Intermediates NP 728

Michigan Chemical Corporation, Saint Louis, Michigan, has announced full scale production of two new pharmaceutical intermediate, β-dimethylaminoethyl chloride hydrochloride and betadimethylaminoisopropyl chloride hydrochloride. The former is important in the manufacture of new, highly effective antihistaminic compounds, and is practically non-hazardous to use as compared to the free amine. Beta - dimethylaminoisopropyl chloride hydrochloride is useful in the manufacture of analgesics.

Both compounds are made to strict specifications and in grades and purity suitable for pharmaceutical manufacture.

Resin Syrup Remover NP 729

A product known as "Edisonite R" has been developed for cleaning surfaces contaminated with resin syrups. "Edisonite R" is a free-flowing, white, water-soluble powder. It may be used on the hands, on wood, metals, glass and rubber. The powder may be used directly along with water or in a solution of about an ounce to a pint of water prepared.

This product is also an excellent and efficient cleanser for laboratory glassware and equipment.

It is manufactured by Edison Chemical Co., and is furnished in five pound cans and one hundred pound bags.

Protective Coating NP 730

A new protective coating specially designed to cover plastic mold marks and to impart a high lustre and gloss to polystyrene and other plastic products is now being made by Schwartz Chemical Co., Inc. Available in a variety of colors, it is said to be ideal for painting or decorating plastic dolls, toys and novelties.

Called Rez-N-Lac, the liquid dries quickly and forms a permanent skin of finger-nail hardness on the surface of polystyrene as well as acrylics, acetates and nitrates. The new coating can be easily applied by brush, spray or dip and dries within 15 to 30 minutes to sanding hardness.

Hemin Chloride NP 731

Armour and Co. is now making pilot-plant quantities of hemin chloride as a service to scientists and physicians interested in studying its properties. Hemin chloride, an iron-containing compound isolated from bovine blood, possesses

at last...

AN MS-SOLUBLE ALKYD COMPATIBLE WITH AMINE RESINS

aroplaz 1081-M

Aroplaz 1081-M is a pure oxidizing medium oil length alkyd with this singular advantage over other resins of its type—

Compatability in all ratios with most melamine and urea resins!

AND . . . Aroplaz 1081-M can be baked or air-dried *without* amine resins as well.

The high viscosity of Aroplaz 1081-M provides top package consistency with low solids. Air dried films of the resin exhibit good gloss . . . toughness . . . adhesion . . . exterior durability.

Use it in white or colored industrial formulations . . . general utility vehicles . . . shelf goods materials—for application by brush, dip, or spray.

For samples and complete data, phone or write U.S.I. today.

Specifications

Non-Volatile	49-51%
Solvent	Mineral Spirits
Viscosity (G.H.)	Z_1-Z_5 (63.4-148 poises)
Acid Value (Solids)	6-10
Color, Solution (Gardner '33)	6-8
Wt. per Gal. at 25°C (Solution)	7.65-7.75 Pounds
Wt. per Gal. at 25°C (Solids)	9.20-9.30 Pounds
P.A. Content of Non-Volatile	34% by weight
Oil Content of Non-Volatile	50% by weight

Finishes for farm tractors . . . other industrial applications . . . are tough, exhibit good durability when based on Aroplaz 1081-M. In general utility vehicles, too, it provides top performance.

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AMERICAN Industry has a valued "silent partner" in Sulphur, which lends its unique chemical properties to a multitude of industrial processes. For instance, Sulphur is used to help make pulp and paper, rubber, steel, rayon, fertilizer and other necessities—yet seldom appears in the finished product.

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novel pro-oxidant properties, is relatively insoluble in water, and may have a valuable use as colorimetric standard in the determination of human hemoglobin.

Fuel Oil Cleaner NP 732

A new fuel oil additive, Houghto-Solv, which is designed to clean oil systems from tank to stack has been developed by E. F. Houghton & Co. Sludge deposits in oil tanks and systems have long been a problem to plant maintenance men. The answer is a mixture that takes the sludge into solution and makes it a burnable part of the fuel.

Houghto-Solv meets all plant safety regulations. It is safe to use and store and it not toxic. It is non-corrosive and will not harm metals or working parts of the heating system. It also stops formation of soot which insulates boiler surfaces and cuts down heat values. Houghto-Solv is added directly to the fuel tank in the ratio of one quart to 1,000 gallons of fuel oil. The cost is less than $\frac{1}{10}$ of a cent per gallon of fuel oil.

Water-Resistant Paper Adhesive NP 733

A new water-resistant seam adhesive for paper drinking cups and similar types of food containers is offered by the Resyn Department, National Adhesives. Called Cup-Seam, it is a white emulsion which dries to a clean, colorless film; and the solution itself is odorless, free from solvents, and non-toxic.

Cups and food containers produced on regular equipment have undergone extensive usage tests. The results indicate that cups fabricated with Cup-Seam are highly water-resistant and will withstand contact with both hot and cold liquids for a prolonged period of time without leakage or staining of the paper.

Metal Cleaners NP 734

Two new metal cleaners, said to be effective individually or in combination for cleaning a wide variety of metals and alloys, are being made by Calgon, Inc.

Calgon Metal Cleaner No. 21 is a dry granular alkaline detergent for spray-cleaning in metal-washing machines. It has also proved effective when used in combination with the new Calgon Emulsion Cleaner for immersion cleaning in dip tanks and for heavy-duty spray cleaning. Containing glassy sodium phosphate, it ties up water-hardness salts—principally calcium and magnesium—to prevent their deposition.

Calgon Emulsion Cleaner is a white, creamy emulsion of an organic solvent in a relatively small amount of water. It readily disperses when added to the cleaning bath. It is especially recommended for use in combined solution with Calgon Metal Cleaner No. 21 for

Courtesy of Becton, Dickison & Company, Rutherford, New Jersey

PENNSALT *hydrofluoric acid*

. . . for ETCHING • POLISHING • FROSTING

Many glass manufacturers everywhere have shown a preference for Pennsalt Hydrofluoric acid . . . and found that it fulfills exacting requirements . . . from etching precision medical instruments of glass, to frosting, polishing and etching fine decorative glassware.

In addition, Pennsalt HF is reliable for frosting electric light bulbs, pickling stainless steel, cleaning castings, improving the quality of glassmakers' sand and other important industrial raw materials . . . as well as in the preparation of fluorine compounds.

Pennsalt HF is available in strengths of 30%, 52%, 60% and 80% for domestic users; 71-75% for export. Strengths 60% and above shipped in steel containers . . . weaker strengths in rubber drums. Write for full details. Heavy Chemicals Division, Pennsylvania Salt Manufacturing Company, Philadelphia 7, Pa.

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immersion cleaning or especially difficult spray-cleaning. The combination of the two cleaners provides the advantages of an alkaline cleaner with those of an organic solvent.

The organic solvent, by reducing the viscosity of heavy oil, aids emulsification. The combined cleaners are reportedly extremely effective for saponification of fats, deflocculation or dispersion of dirt, and emulsification of oils and greases.

Calgon Emulsion Cleaner, when used alone or in combination with an alkaline cleaner, is easily rinsed from the metal surface with either hot or cold water, leaving no solvent or other film. This is particularly important when the cleaning is to be followed by certain types of treatment, such as electroplating.

Plastic Caulking NP 735

A new type of jointing material for sealing cracks or openings which form between tile walls and bathtubs has been developed in the research laboratory of the American Fluresit Co.

Called Tub-Tite, it is a resin-based plastic caulking that comes in a tube, and is recommended for sealing cracks in and around washstands, shower stalls, drinking fountains, show cases, refrigeration and locker units, aquariums, and the like. It will cement linoleum to a wall or sink drainboard, and keep the surface smooth and level. It is also recommended for industrial uses, such as sealing air conditioned rooms, control instruments and explosion-proof motors.

The new product contains no lime, cement, plaster of Paris or drying oils. It is based on a plasticized resin which dries by solvent evaporation, and adheres to tile, glass, wood, metal, brick and concrete.

Adenosine-5-Phosphoric Acid NP 736

Production of adenosine-5-phosphoric acid has been established by Ernst Bischoff Co.

Adenosine-5-phosphoric acid, called My-B-Den, is a purine nucleotide present in cozymase and the Warburg-type respiratory enzyme, and constitutes an essential link in basic life processes. Fundamental in phosphorylation reactions of biochemical systems, it plays a vital metabolic role in energy transfer and muscle action. Recent clinical and pharmacologic reports emphasize the importance of extended and intensive investigation of its application to the treatment of vascular disturbances, cardiovascular and degenerative diseases.

It is supplied as the crystalline free acid. A typical preparation shows a purity of 99.5%. This is based on the adenine, ribose and phosphorus content and the molar ratios of these substances. No inorganic phosphorus is present.

good judgment

The performance of Harshaw chemicals will confirm your judgment in purchasing them. For more than 50 years the selection of Harshaw chemicals has proved to be the correct choice for thousands of buyers. • The Harshaw trademark symbolizes unvarying first-line quality. It assures you that the Harshaw laboratories are striving for perfection and continuously searching for new developments . . . and that control laboratories in each Harshaw plant guard carefully the quality of the products manufactured. • You will make a correct decision . . . exercise good judgment . . . and help yourself to progress . . . when you specify Harshaw chemicals.

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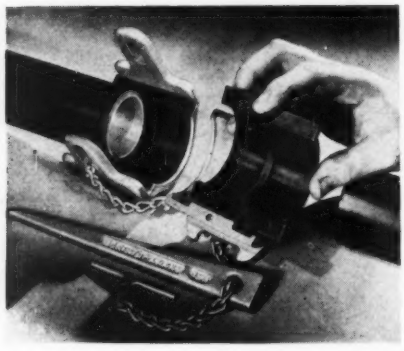
NEW EQUIPMENT

Buffer Gasket QB 565

Speed, economy and flexibility can now be brought with complete safety to the coupling of glass or porcelain lined pipe.

Drinkwater, Inc. has developed a new gasket that features a special buffer ridge projecting inwardly from a solid rubber wall. Pipe ends, when joined, abut



against this ridge, which cushions them from shock and prevents them from grinding against each other with resultant cracking or chipping. The buffer ridge also serves to prevent a drop-off at this point. By matching the I. D. of the pipe, the ridge provides both a tight seal and a complete lining that guarantees a smooth flow throughout the pipe system.

Butyl and Buna-N compounds are used in standard Presto-Lock gaskets. Temperatures up to 180 degrees F. are possible. Butyl rubber is preferable for conducting hot and cold water, steam, acids and alkalies in water solutions. Buna-N is best used with oils, gases and solvents. Although the line is designed for use with standard steel pipe sizes, the gaskets will take up a .125″ variation in O. D.

Seven sizes are offered. Sizes 1¼″, 1½″, 2″, 2½″ and 3″ have one wedge secured by a chain assembly. The large 4″ and 6″ couplings have two wedge keys. The wedges hold together the two corrosion-resistant malleable iron castings, finished in an aluminum enamel.

Diaphragm Control QB 566

Hammel-Dahl's 4000 Series pressure loaded diaphragm control valves eliminate both packing boxes and springs and provide supersensitive regulation wherever the controlled fluid may come in contact with the diaphragm. Fluid pres-

sure from the outlet side of the body is applied to the under side of the larger area diaphragm instead of springs. Loading pressure from a remote operator or air operated instrument is applied to the upper side of the diaphragm. The construction provides an almost frictionless valve, with no hysteresis. Either cast iron or steel bodies can be provided with a maximum working pressure of 250 psi. When firing boilers or stills on natural gas, these valve prevent inlet pressure variations from disturbing the controlled gas pressure. Input to output pressures range from 8 to 1 or 1 to 8 may be provided.

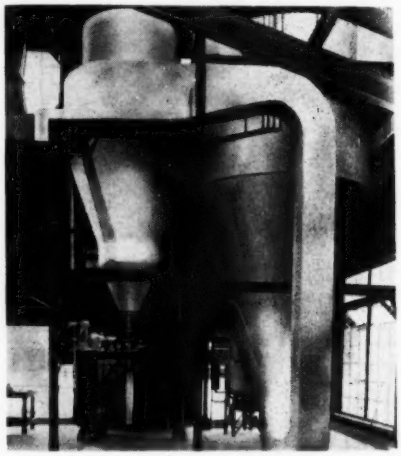
The valves use large area diaphragm cases made from 3/16″ steel stampings. The lower steel diaphragm case is welded to a forged steel flange which is piloted into and bolted to the valve body, thereby reducing valve height to a minimum. Travel stops are provided. Top and bottom guided parabolic plugs are used. The lower end of the plug is hexagonal in shape as is the corresponding plug guide bushing, and it is not necessary to pin the valve plug to the plug stem. When a valve handling dirty gas must be cleaned it is necessary only to unbolt the blind head and unthread the valve plug from the valve stem. Large diameter connections are provided under the diaphragm to insure maximum speed of response.

Conveyor QB 567

A newly re-designed flat belt conveyor is being produced by George Haiss Mfg. Co. It has capacities of 70 and 100 tons per hr. and is furnished with belt widths of 14″ and 18″, in lengths ranging from 20′ to 40′. It is driven by either air or water cooled engine or electric motor with protective housing. Features included are rubber pulley lagging, cam adjusted feed end pulley, and a scraper plate tip which adjusts to pulley position for accurate alignment. A rigid channel construction mast type truck with swivel wheels is available.

Spray Dryer QB 568

The new spray dryer of Bowen Engineering, Inc. will produce five to ten tons of finished product per day. It is a



compact unit and is furnished as a complete operable unit requiring a minimum amount of field erection.

Complete instrumentation and safety controls are provided for fully automatic operation. A salient feature is ease of adjustment and flexibility of operation.

The dryer is available in mild or stainless steel with direct or indirect heaters,

CHEMICAL INDUSTRIES TECHNICAL DATA SERVICE

CHEMICAL INDUSTRIES, 309 W. Jackson Blvd., Chicago 6, Ill. (8-8)

Please send me more detailed information on the following new equipment:

QB565	QB571	QB576	QB582	QB587	QB593	QB599
QB566	QB571a	QB577	QB583	QB588	QB594	QB600
QB567	QB572	QB578	QB584	QB589	QB595	QB601
QB568	QB573	QB579	QB585	QB590	QB596	QB602
QB569	QB574	QB580	QB585a	QB591	QB597	QB603
QB570	QB575	QB581	QB586	QB592	QB598	QB604
						QB605

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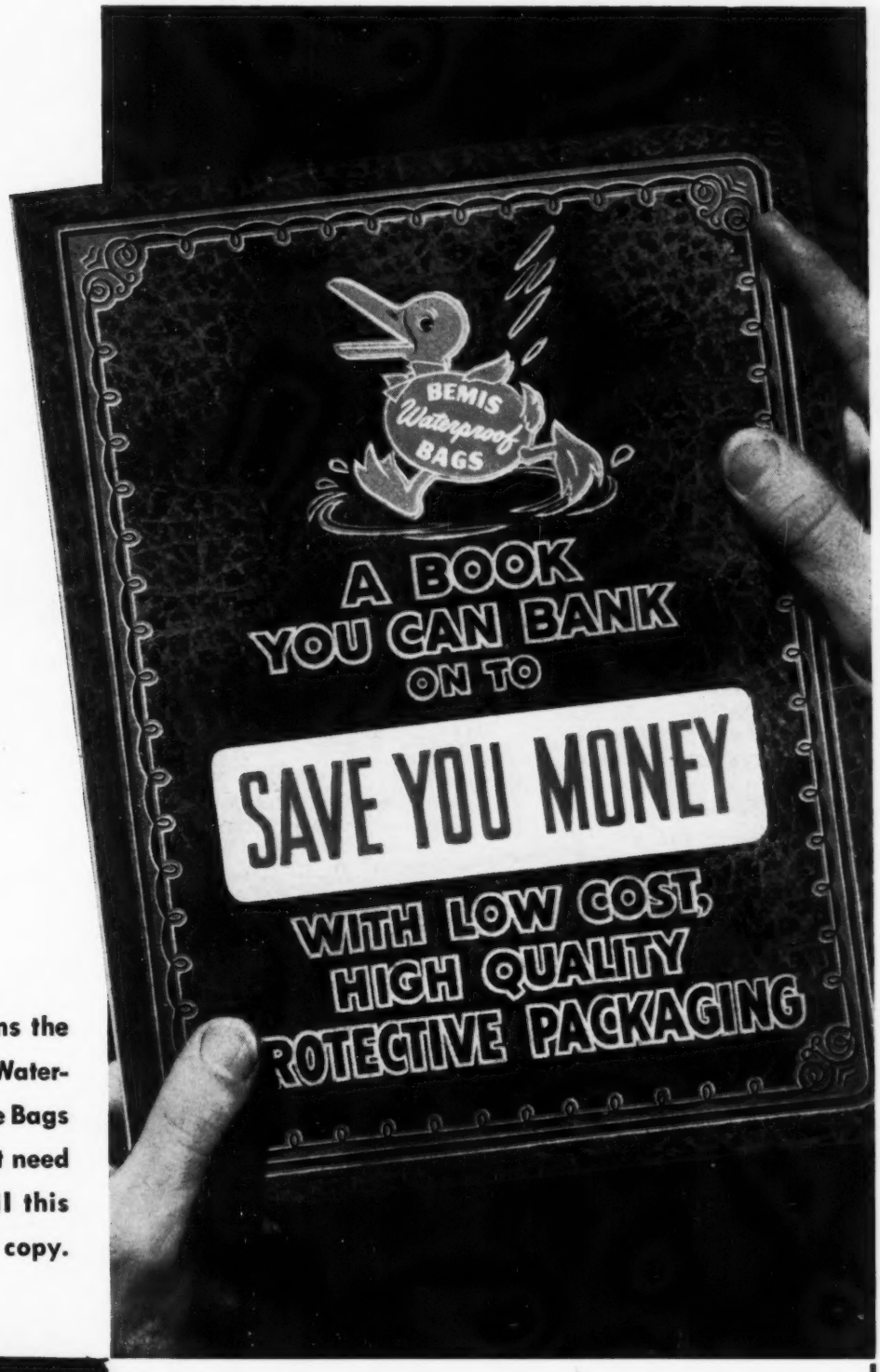

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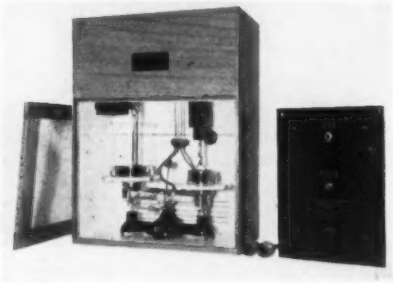
single or multiple-stage dry collection and wet collection, and various atomizers.

The unit occupies a floor area of 12′ x 20′ and can be installed out of doors.

Liquid Balance QB 569

The flow rate of any liquid can now be automatically determined by weight by the new Erdco automatic liquid balance.

The automatic liquid balance makes all manual operation unnecessary. It



measures the time required for a given quantity of liquid to flow, as determined by balancing against a calibrated weight and is independent of the physical properties and temperature of the liquid.

The weighing section is installed in a cabinet with removable glass door, 24″ high, 18″ wide, and 9″ deep. The remote control unit is in a flush mounting metal box, having a panel size of 9½″ x 15¾″. It may be equipped with an electric stop clock or counter.

Refrigeration System QB 570

Niagara Blower Co. No-Frost Method of refrigeration cools air below the freezing point of water without permitting the formation of frost or ice on refrigerant coils. The equipment consists of the fan spray cooler, which chills air and distributes it as required, the concentrator, which maintains the proper concentration of No-Frost liquid, the condenser, which condenses the refrigerant gas and controls the head pressure at which the compressor operates, and the compressor.

Air is chilled through contact with coils and a recirculating cold spray. As moisture is condensed from the air stream this solution becomes diluted, but as this occurs the proper quantity is diverted to the concentrator where the excess water is evaporated. The re-concentrated liquid is returned to the spray cooler, assuring continuous operation without interruption for "defrosting".

A filter in the liquid line removes any dirt or foreign material that the air stream may have picked up and deposited in the liquid, and a metering gear pump is used to insure uniform delivery of the correct amount of liquid to the concentrator regardless of increased pressure resulting from the operation of the filter, and in proper proportion to the amount of condensation taking place in specific cooling or product freezing applications. When the pressure reaches 50 psi. the operation is automatically shut down by a pressure switch and a warning light signals the operator to clean the filter. Component units are built in a range of sizes suitable for installations using ten tons of refrigeration upwards.

Hose Coupling QB 571

The new high pressure hose coupling of the Bar-Way Mfg. Co. will withstand pressures of more than 3,000 psi with a pull of over 500 lbs. It is available in ½″, ¾″, and 1/10″ I. D. with any commonly used thread.

Made for fabric rubber-covered hose, it is bronze and comes chrome plated upon request, 4½″ long and streamlined to eliminate projections. The full inside diameter of the hose is maintained throughout the coupling so there is no friction loss or restriction of flow. An internal expansion method of attaching the hose to the coupling permits light weight construction and enables it to be changed in the field.

Magnetic Gas Valve QB 571a

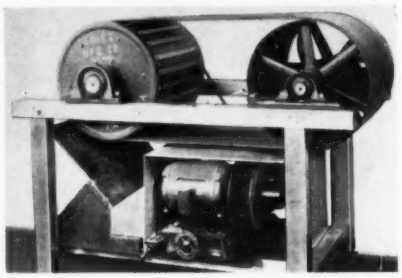
The new General Controls K-3H (hermetically-sealed) magnetic gas valve is designed to eliminate the possibility of

gummy or foreign matter forming in the solenoid and restricting plunger operation. A diaphragm construction positively seals the operator from the fuel gas without interfering with valve operation. The solenoid operator is completely sealed to atmosphere and in event of diaphragm rupture prevents all external gas leakage. The K-3H closes automatically upon current failure.

The K-3H valve opens and closes a gas fuel supply line in response to room thermostats, limit controls or similar devices. This valve is adaptable to warm air furnaces, gas-fired boilers, industrial furnames, conversion burners, and most domestic heating appliances; and is available in sizes from ⅜″ I.P.S. to 1¼″ I.P.S. inclusive.

Magnetic Pulley QB 572

A new type of magnetic pulley produced by the Eriez Mfg. Co. is non-electric, removes fine iron or less magnetic particles and affords automatic separation of ferrous from non-ferrous material rang-



ing in size from ten to two hundred mesh. At one inch from the pulley's surface, the magnetic field is approximately three times as strong as a standard pulley. The effective cleaning surface has been increased substantially by narrowing the air-gaps and increasing the number of pole plates. Designed for use as a head pulley in belt conveying systems, the unit is available in 18″ and 24″ diameters, in belt widths ranging from 12″ to 60″ and is crowned to prevent belt weaving. Belts of any non-magnetic material may be effectively used. Shaft diameters are standard to permit replacement of non-magnetic pulleys in existing installations without changing bearings or shaft mountings.

Dryer QB 573

The F. J. Stokes Machine Co. has designed an atmospheric double-drum dryer which is easily cleaned and quickly adaptable to different production uses. Welded steel is used for end frames, doctor knife assemblies, etc., and rounded corners and sloped surfaces prevent dust and dirt accumulations.

The angle of the doctor knives and the knife pressure along the drum face are adjustable. The drums are cast from special alloys and treated to assure maximum dimensional stability. Protection from damage to the drums by hard particles passing between the rolls is accomplished by quick-acting pressure releasing devices.

Drum drive speeds are variable by either mechanical or electronic controls that are protected against overload. Journal bearings are of the anti-friction type, equipped with labyrinth seals, force-feed oil lubricated, with oil circulating systems protected by ample storage tank, filter and (where necessary) an oil cooler.

Special shields guide dried materials

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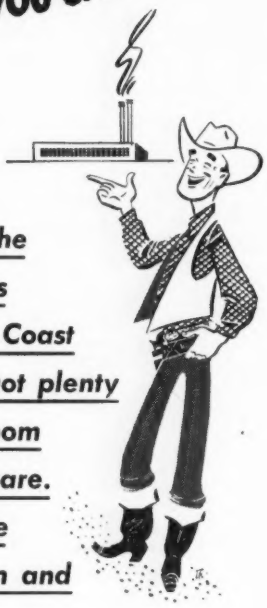
Smilin' Tex says:

"IT AIN'T BRAGGIN' IF YOU CAN PROVE IT"



On the Texas Gulf Coast we got plenty of room to spare. Come down and see.

Down here in the Texas Coast Country we got plenty of room for plenty of mill sites and homes, and plenty of what we call "elbow room" for play and recreation. This last is important to a worker and his family.

And there are other Texas "plenties": a superabundance of the chemical industry's three basic essentials — sulphur, salt and hydrocarbons.

We got plenty of natural gas — 58% of the Nation's known reserve. It's the cleanest, most economical fuel you can buy.

Plus the finest of transportation facilities—land, water and air. Friendly, intelligent "home-grown" labor; no sales tax, no state income tax.

Yes, Texas is a big state. We got plenty of room, plenty of sunshine, plenty of pure water . . . plenty of anything you need to put a new plant into the profit side of the ledger.

Send for a Survey of the Texas Coast Country. On request, we will prepare for your company a carefully engineered and confidential survey of the Texas Coast Country individualized to fit your particular problem. No cost, no obligation. Address Research Department, Houston Pipe Line Company, Houston, Texas.

HOUSTON PIPE LINE CO.

Subsidiary of Houston Oil Company of Texas

GEO. A. HILL, JR., President

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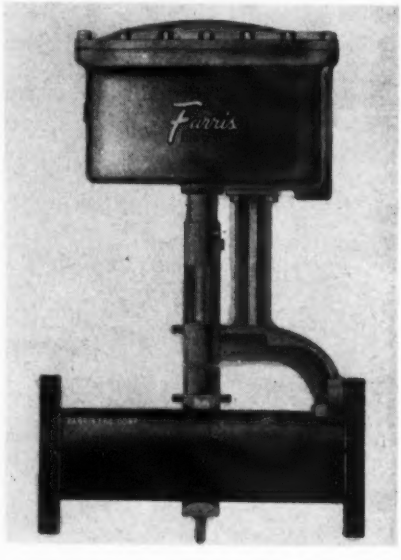
into conveyor troughs. By a system of manifolds on these guide shields, and the use of compressed air, necessary cooling is accomplished and the tendency for some materials to leave the knives in rolled-up form is eliminated. At the same time, end scrapers reduce the chance of material working in between drum ends and end boards, cutting wear on the latter.

Bottom-feed systems can be incorporated with liquid-level controls. Patented devices used with top-feed systems assure even and continuous feeding. Vapor hoods and plenum chambers to control dust and total enclosures can be supplied.

Automatic Pinch Valve QB574

A series of automatic controls for use with the new pinch valve of the Farris Engineering Corp. is operated with dual opposing pistons under the same loading conditions and with the same controlled movement. The Dual Drive is self-guiding and has very heavy bearings both inside and outside on each sleeve. The special O rings developed for this mechanism prevent air or water leakage. No packing glands are employed.

Standard construction for the unit is heavy cast aluminum case with non-copper bearing parts in the balance of

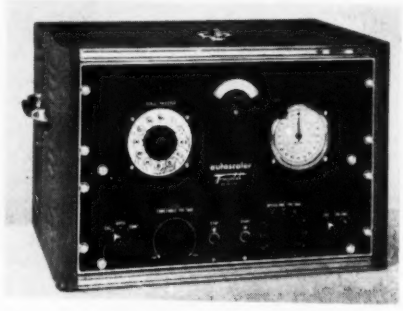


the mechanism. The force is maintained throughout the entire stroke rather than proportional as in a diaphragm operated type.

In conjunction with the unit, remote operation can be obtained in either one of two methods, both offered for off-on control, and in the case of a basic instrument type, for non-precise throttling. The first assembly consists of the standard drive used in conjunction with a 4-way valve. In operation, pilot pressure loads the Dual Drive holding it in closed position. To open, the 4-way valve is reversed in its operation, shutting off the pilot supply and allowing discharge. On the instrument type, throttling operation can be had on the first third of the travel of the pinch valve. The second 2/3 of opening serve only to change the shape of the valve itself and has no appreciable flow characteristic. The instrument type is recommended where line pressures through valve do not exceed 20 psig.

Autoscaler QB575

Tracerlab, Inc. is now manufacturing an autoscaler whose range of high voltage supply is continuously variable from 500 to 2200 volts and is electronically regulated to 0.01% per percent change in line voltage. A time delay circuit con-



trols the application of high voltage until all circuit tube filaments have come up to operating temperature.

The autoscaler is a compact, complete unit for supplying the operating voltage for a G-M tube, counting the impulses from this tube, and measuring the time required for collecting a given number of impulses. The scaling circuit and precision timer are actuated by a pushbutton. When a predetermined number of impulses has been counted, the timer is automatically stopped and the action of the scaling circuit interrupted. The number of counts having been preselected, there is no need to read neon interpolating lights.

The overall resolving time of the input amplifier and scaling circuits is approximately 5 microseconds. Since all counting is done electronically, losses at high counting rates due to inability of the register to record are completely eliminated. Pulse height sensitivity is approaximately 250 millivolts.

Fire Extinguisher QB576

A new, wheeled, foam engine, designed to produce better fire-fighting foam and more of it faster, has been put on the market by the Pyrene Mfg. Co.

The extinguisher, 40-gal. capacity, is an improved weapon against principally flammable-liquid fires. It will deliver from 375 to 400 gals. of foam—an increase of one-half over the Phomene—in three and a half minutes. The foam

SMOOTH SAILING..

takes more than good weather and a fair wind...

For smooth sailing depends to a great extent on the efficiency of the control exercised by the pilot.

Now in handling media in an industrial plant, the pilot is a valve and "smooth sailing" is dependent on the efficiency of its control.

And when it comes to flow control equipment, Powell Valves are making an important contribution to "smooth sailing" in every branch of industry.

Powell Valves are noted for long, dependable performance at a minimum cost of maintenance. Moreover, there's a Powell Valve—in Bronze, Iron, Steel, or any required Corrosion-Resistant material—to satisfy the demands of every known service.

Fig. 2309—Small Flush Bottom Tank Valve. Disc rises into tank to open valve. Sizes ¾" to 3", incl. Also available with disc lowering into valve to open (**Fig. 2310**). Sizes ½" to 3" incl. Other designs of Powell Flush Bottom Tank Valves are available in sizes 4" to 8", incl.

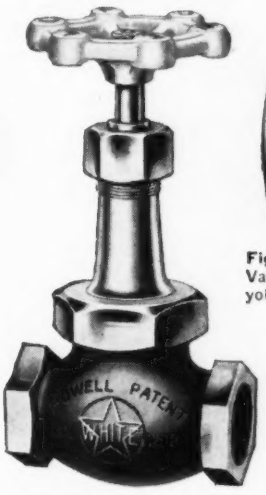


Fig. 1708—200-pound Bronze Globe Valve with screwed ends, union bonnet, renewable, specially heat treated stainless steel seat and regrindable, renewable, wear-resisting "Powellium" nickel-bronze disc.

Fig. 2051—150-pound Stainless Steel "Y" Valve with flanged ends, bolted flanged yoke and outside screw rising stem.

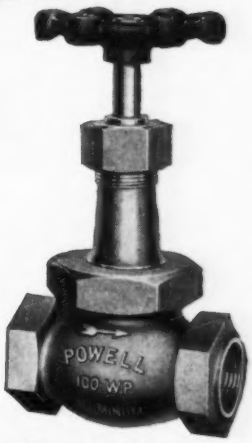


Fig. 1853—100-pound Aluminum Globe Valve with union bonnet, stainless steel stem and renewable vulcanized composition disc.

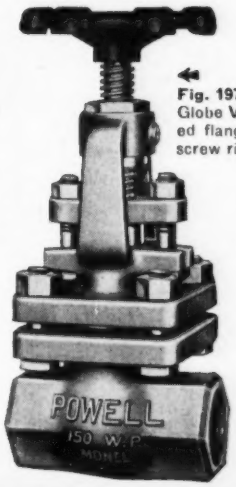


Fig. 1978—150-pound Monel Metal Globe Valve with screwed ends, bolted flanged yoke-bonnet and outside screw rising stem.

Fig. 375 — 200-pound Bronze Gate Valve with screwed ends, inside screw rising stem, union bonnet and renewable, wear-resisting "Powellium" nickel-bronze disc.

The Wm. Powell Co., Cincinnati 22, Ohio

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POWELL VALVES

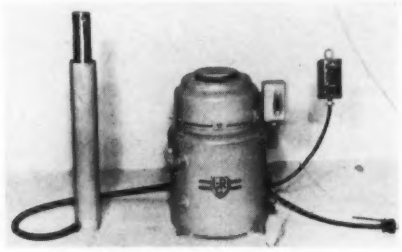
stream has a range of 40 to 55 feet.

The interior of the extinguisher has been re-designed to alter the rate of chemical action and an improved foam stabilizer has been introduced into the chemical charge.

Hydraulic Pump QB 577

The Lyon-Raymond Corp. has designed a hydraulic power unit that will deliver 1½ gal. of oil per min. and develop a pressure of 1000 psi.

Compactness has been made possible by the use of a flange mounted motor which



is placed directly on top of the oil reservoir. Although the reservoir has an oil capacity of 2½ gal., the entire pump assembly is only 18¼" high by 12½" in diameter. The unit is furnished with all controls. A ¾ HP A-C motor is available for 110, 220, or 440 volts.

The valves use an "open center" arrangement which permits the motor to idle except when the unit is pumping oil to the pressure line. An adjustable relief valve and the electric control valves are built into the base of the unit so that they are made accessible by tilting the assembly slightly. The standard unit is furnished with a 3 way valve for operating a single action hydraulic cylinder. Four way valves for operating double action cylinders are available.

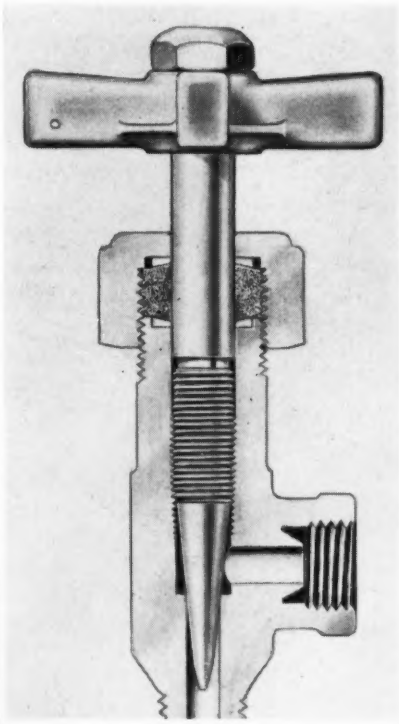
Plugs and Connectors QB 578

A new line of "Self-Sealing" test plugs and pressure line filling connectors of the Mechanical Products Corp. equipped with expanding head pull rods, employing a unique sealing principle and requiring only seconds to insert or remove, are designed to seal plain or threaded holes in flanged or fitted openings of practically any depth. The unique feature is the manner in which testing pressure from within the tank or vessel is utilized to actuate a piston or plunger with sufficient force to hold an effective seal regardless of the actual testing pressure used.

A safety feature and positive holding action is controlled by the bayonet lock in cylinder. This prevents use of plugs or connectors until the expanding heads are properly anchored or engaged against the inside edge of flange or fitting and the plunger is free to be actuated by the internal testing pressure to force and hold the neoprene seal firmly against its seat. The entire pulling force is taken up by a solid stem or pull rod which is securely fastened to a heavy wall in cylinder. Stock sizes for ¼" to 2" pipe openings are available for standard flanges and are suitable for any testing pressure to 500 P.S.I. Interchangeable expanding stems for extra depth flanges and fittings may be had on short notice. The seals may be readily replaced when worn.

Needle Valve QB 579

A specially designed needle valve for the sensitive metering of fluids and gases has been developed by The Parker Appliance Company, Cleveland, O. It has



a 5/16"-40 stem threading for close adjustment, and a long 10° included angle tapered needle for fine metering.

The standard valve is of high-strength brass, but aluminum alloy bodies can also be supplied. Needle stems are machined to close tolerances in duronze. A premolded packing insures a long life stem seal. The valve is available in ⅛" and ¼" sizes, with eight port combinations of male and female, pipe and tube connections.

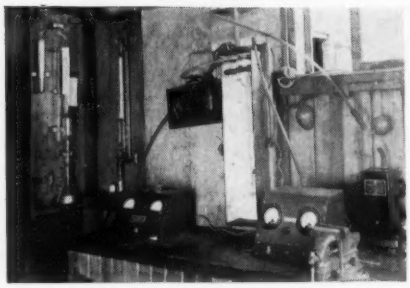
Centrifugal Pumps QB 580

Centrifugal pumps with a wide range of capacities and heads have been added to the Bowser line. Single and two-stage units ranging from ¼ to 75 HP, 10 to 2500 gpm—including self-priming types—are suitable for viscosities up to 8000 SSU.

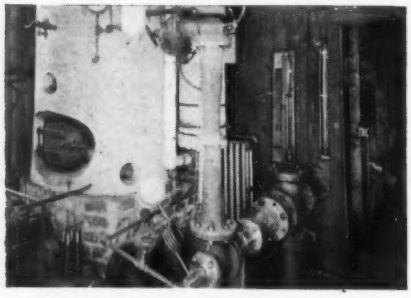
Models available are: (1) Close-coupled with common shaft—two feet

What's Behind a CR Evactor?

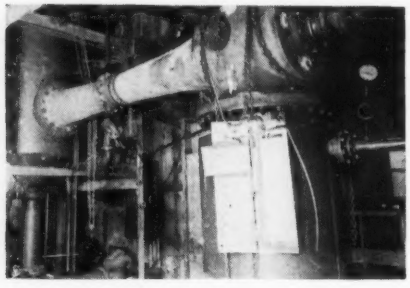
The production of Evactors is no routine operation at the Croll-Reynolds plant. Although CR engineers have over thirty years of industrial vacuum experience to guide them, the Croll-Reynolds testing and development department is one of the important units of the company. Development work is constantly under way to improve the efficiency of Croll-Reynolds Evactors wherever it is possible. It is this never-ending research and development which give CR Evactors their exceptional efficiency.



1. Instruments in the CR laboratory set up for measuring extremely high vacuum.



2. Special boiler in the CR pilot plant for providing unusual conditions of high pressure steam or superheat (or both) to duplicate the working conditions in customers' plants.



3. A 30-inch CR Booster Evactor on test in a CR shop.

CROLL-REYNOLDS CO.

17 JOHN STREET, NEW YORK 7, N. Y.

CHILL VACTORS STEAM JET EVACTORS CONDENSING EQUIPMENT

CROLL-CR-REYNOLDS

WHERE FILTRATION MUST BE PRESSURE

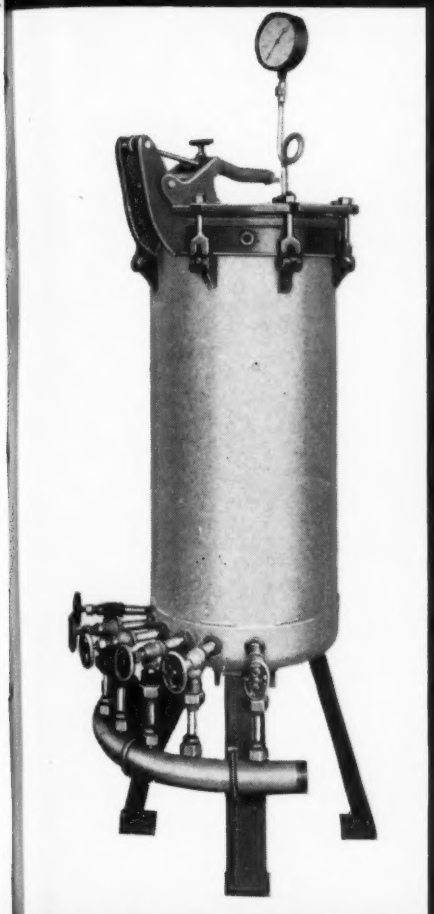
These FILTERS OFFER GOOD SELECTIVITY

It's too bad that not all filtration or clarification can be handled by the continuous vacuum method because of its simplicity, ease of handling and economy. But since some products just cannot be handled that way, PRESSURE FILTRATION is definitely in the process plant picture. That's why Oliver United engineers have continued to develop pressure filters and broaden their knowledge of pressure filtration.

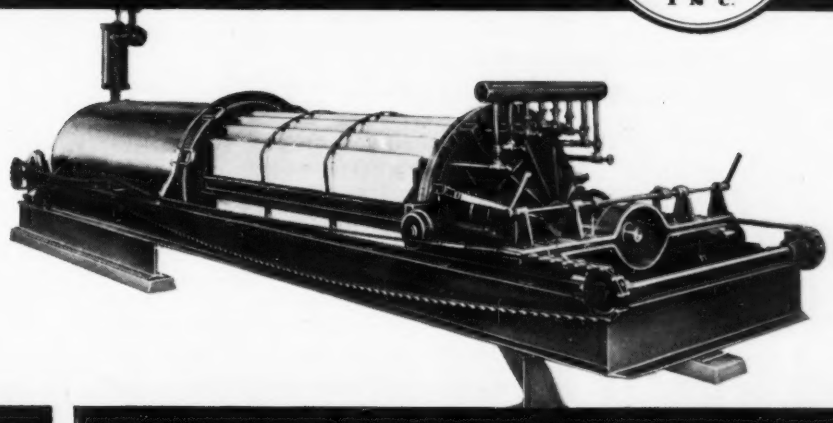
We can offer the four distinctly different filters shown. The Oliver Pressure and Oliver Precoat are essentially clarifiers or "polishers" and the Kelly Filter is primarily a "high pressure" unit or for use where a jacketed unit is required. All offer advantages over conventional filter presses.

If you have a job that is labeled "pressure filtration" write us about it. Perhaps one of these four filters would be better than the conventional press.

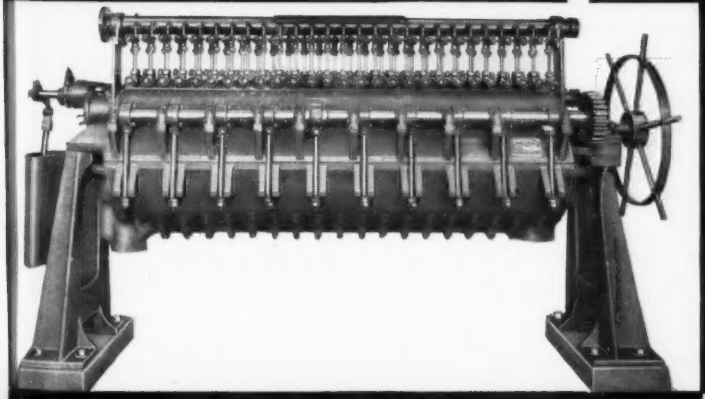
OLIVER UNITED FILTERS INC.



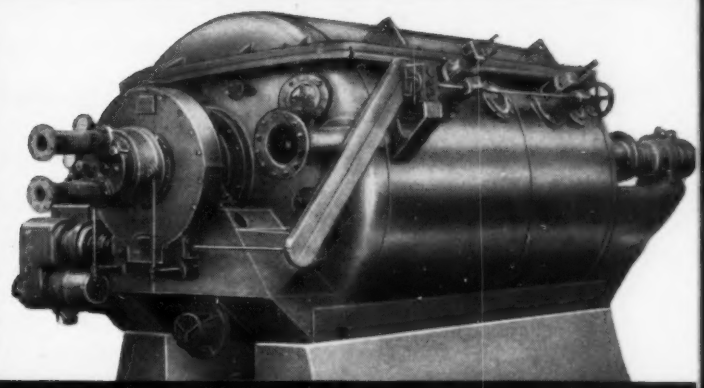
• Oliver Pressure Filter



• Kelly Pressure Filter



• Sweetland Pressure Filter



• Oliver Pressure Precoat Filter

New York 18, N. Y., 33 West 42nd Street
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San Francisco 11, California
Western Sales Division: Oakland 1, Calif., 2900 Glascock Street

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PLAN TO ATTEND

CHICAGO COLISEUM

NATIONAL CHEMICAL EXPOSITION

OCTOBER 12 · 13 · 14 · 15 · 16 1948

under pump and two under motor, (2) Close-coupled with pump mounted on extended motor shaft and pump adapter—four feet under motor; (3) Pump mounted on base plate, with or without motor and flexible coupling, (4) Self-priming pump mounted on base plate, with or without motor and flexible coupling.

Pump constructions: All iron, bronze fitted or all bronze with steel shafts and closed or open impellers.

Humidity Simulator QB 581

A new humidity unit is in production at Bowser, Inc. Atmospheric humidity conditions ranging from 20% to 95% from + 35° F. to + 175° F. (dry bulb) are produced and maintained automatically in four cabinet sizes from 10 cu. ft. to 35 cu. ft. capacities.

Controlled humidity conditions are used to determine moisture resistance or performance and for processing under controlled conditions.

All models operate on 110-volt, 60-cycle, single phase current. The wet bulb control and humidity reservoir water level are maintained by float valves. Air movers provide circulation within the stainless steel test space.

Conveyor Belt QB 582

Twistex woven wire conveyor belt, produced by the Cambridge Wire Cloth Co., permits continuous movement of work through machines.

The new design combines maximum belt strength with maximum open area. The mesh size can provide up to 87% open area, while the coiled construction utilizes the maximum strength of the metal. These large openings are extremely useful in industrial washing machines, as wash water or spray can be directed from above or below the belt and passes freely over the work, draining readily back into the wash tank.

The belt can be manufactured from any metal or alloy, to a wide variety of meshes, and for sprocket or roller drive.

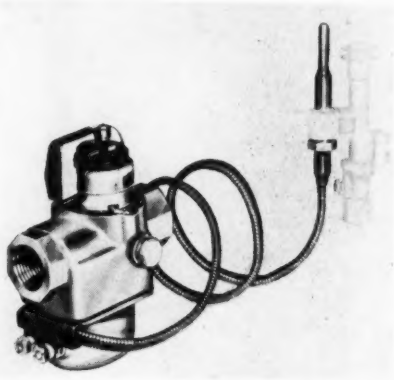
Grinding Ball QB 583

H. K. Porter engineers have found that an "irregularly spherical" ball is better than a perfect sphere, a rod, or a slug. Hence the new "Tuffalloy" steel ball is like a sphere pushed out of shape, with flattened areas here and there on its surface which present broad areas of impact in comparison with the single-point contact of the perfect sphere. In addition, these flat surfaces insure a positive grinding action, increasing thoroughness and speed of grinding.

Combustion Control QB 584

The new General Controls MR-2 5 is an on-off and safety shut-off control unit designed particularly for floor, central, small space and water heaters. Flow of all gas automatically stops when the pilot is extinguished. During the reset operation, gas flows to the pilot burner only. No gas can pass to main burner until the pilot is ignited and the safety valve set.

The operator can set the single handle handle permits setting of the safety valve handle permits scetting of the safety valve without moving the gas cock from the closed position. It is impossible for the



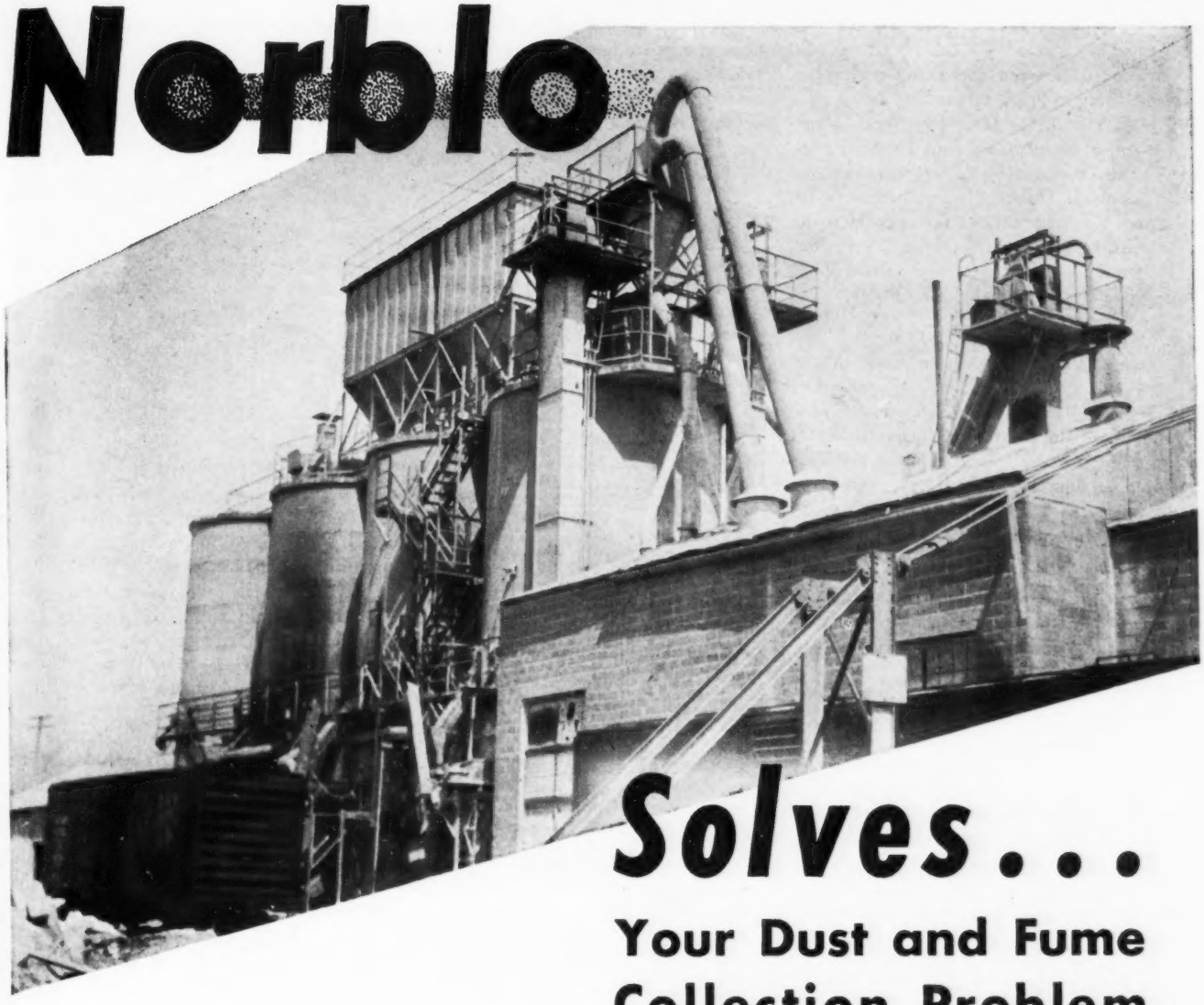
pilot gas to remain on should the operator leave the handle on the off or reset position without pilot ignition being established. Accessible thermocouple terminals permit check of couple or valve operation under normal operating conditions and without breaking connections. The unit is suitable for natural, manufactured, mixed and liquefied petroleum gases.

• QB 585 The Metron *tachometer meter* is mounted in sponge rubber to permit use where severe shock or vibration is present. Directly calibrated in any units, this indicator can measure speeds from 1 to 100,000 RPM.

• QB 585a To supplement its line, Rogers *Electric Kilns* has added five models, with temperature recording or pyrometer. The firing chambers of the kilns have recessed elements which also allow for free spreading of heat throughout the chamber and, in addition, permit easy and inexpensive replacement of the heating elements. On an average, the elements give better than 800 firing hours when fired to 1900°. With firing chamber sizes measuring from 5x5x5½" up to 12x12x12", these kilns are applicable to a variety of laboratory, production, and experimental uses. The manufacturer also constructs special sizes.

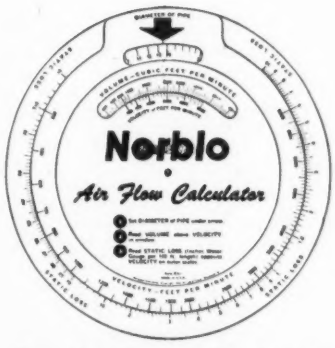
• QB 586 New models added to the Bowser *rotary hand pump line* include a 10 g.p.m., crank-operated barrel pump equipped with a 7½-inch diameter drip pan cast integrally with the bung attachment. Fins in the drip pan support oil cans or other containers. A brass screen excludes foreign matter from the overflow which runs back into the barrel. Suction pipe—¾" x 40"—is beveled on

Norblo



Solves . . .

Your Dust and Fume Collection Problem



Save time—and avoid mistakes—figuring pipe diameter, static loss, etc., for any volume or velocity of air flow in dust collecting or ventilation. Large (6″ diameter) circular slide rule, easy to set and to read. Free—and without obligation—if you use your business letterhead. Address Dept. A3, please.

Whatever your problem, call Norblo in, too. It nearly always costs less in the long run—and often in the short one—to install Norblo Automatic Bag Type equipment. Cylindrical cloth bag filters with automatic cyclic bag shaking and cleaning insure maintained efficiency at maximum capacity. If your specific problem calls for centrifugal or hydraulic dust collection also, Norblo provides either or both in improved types.

Before you decide on any dust or fume collection system or equipment call Norblo in, too.

The Northern Blower Company

Automatic and Standard Bag Type Fume and Dust Collectors, Norblo Centrifugal and Hydraulic Collectors, Exhaust Fans

6418 Barberton Avenue • Cleveland 2, Ohio

lower end. The pump can be fitted with a meter with 4½-inch 8-gallon dial mounted between the pump and spout, totalizing to 9,999 gallons.

Also available is a 10 g.p.m., crank-operated barrel pump with 4½-inch, 8-gallon dial meter mounted between the pump and spout. Deflector prevents water or dirt from entering barrel. Includes bung attachment for either 1½ or 2-inch I.P. openings, and ¾" x 40" suction pipe, beveled on lower end.

• QB 587 The Frank G. Hough Co., announces improvements in their Model HA 10½ cu. ft. *Payloader* and their Model HL 1¼ cu. yd. Payloader consisting of the addition of hydraulic bucket control as standard equipment. Bucket can be dumped gradually or abruptly as desired by fingertip control and can be closed immediately by the same control.

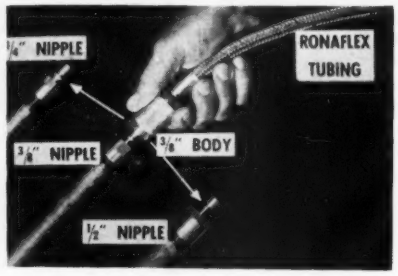
• QB 588 A large capacity *axial flow pump* designed to resist contaminated sea water and other corrosive liquids is being produced by Economy Pumps, Inc. The new pumps are especially suited to condenser circulation, and other services requiring low cost high speed pumping of large volumes of liquids.

Impellers and suction bells are cast of 25-12 stainless steel. Pump shafts are 18-8 stainless. Column and discharge elbows are formed of a high test cast iron containing approximately 2% nickel.

Far more sensitive in performance than those of the centrifugal types, these axial flow pumps are best fitted for applications where any variation in head is a reduction, and where the resultant increase in capacity is not objectionable.

• QB 589 Ronaflex Assemblies, the tubing with *snap-on couplings*, are interchangeable on various nipples. The ⅜" coupling body fits ¼", ⅜", and ½" nipples. The ¼" and ½" bodies also fit all three nipples.

The degree of interchangeability varies with the type of coupling and with



the size. The 1½" and 2" regular coupling bodies are interchangeable with 1½" and 2" nipples. Only a relatively few sizes need be stocked to fit all sizes of nipples from ¼" to 2".

• QB 590 A new *differential pressure control pilot* is being produced by Leslie Co. Designated as Types DD-1 (Direct Acting) and DR-1 (Reverse Acting), the new control pilots provide constant differential pressures for process work. The operating medium which is used to control a suitable diaphragm regulating valve, may be air, clean water, oil or gas.

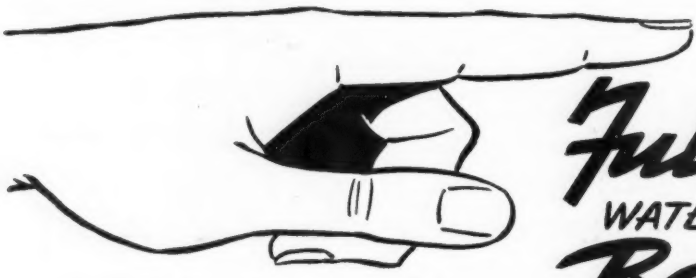
There are three differential pressure ranges, ½–6 psi, 2–20 psi, and 15–75 psi. Maximum total static pressure for all types is 300 psi based on continuous pilot.

When controlling a differential between two pressures, the maker states the higher pressure impulse is applied to the upper side of the diaphragm of the control pilot, and the lower pressure impulse to the lower side. A simple turning of the adjusting nut increases or decreases the differential within the adjustable range.

• QB 591 Cooperative research by American Resinous Chemicals Corp. and Gehnrich & Gehnrich, Inc., has resulted in a practical *fusion oven*, for use in curing Vinosol (organosol) coatings, having overall dimensions of approximately 10′ in width, 10′ in height and 17′ in length and accommodating a web travel of 35 feet. In general, production speeds of 10 to 30 yds. per min. can be obtained.

The oven is of standard insulated steel panel construction and is supplied with a recirculating system so designed as to provide most uniform temperature distribution within the unit. Either gas or electricity may be used as a heating medium. Currently a quantity of direct

WE POINT WITH PRIDE



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You can be certain that your product will arrive at its destination in prime condition when you ship in Fulton Waterproof Bags. Fulton Waterproof Bags are sift-proof and moisture proof, and are unexcelled as containers for chemicals, powders, oily materials, or any product where dusting or control of moisture content is a consideration. For safe, economical, efficient packaging of your product use Fulton Waterproof Bags.

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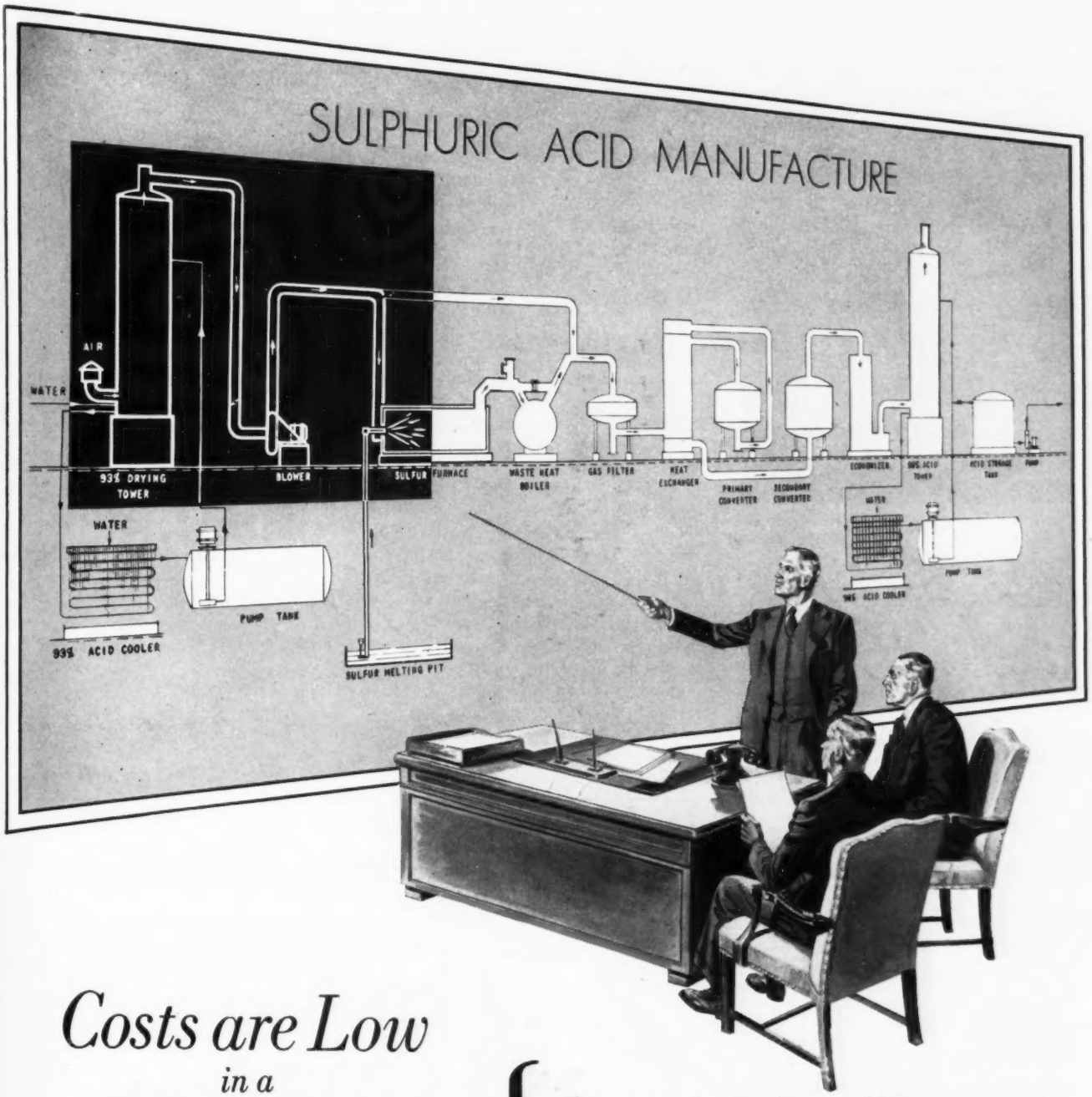

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in a

CHEMICO BUILT CONTACT ACID PLANT

The use of pure U. S. sulphur is common practice in modern acid plants. In a Chemico contact acid plant, the pure sulphur is burned in the presence of *pre-dried air* . . . a method which permits these important cost-reducing benefits:

- ***Recovery of waste heat as high pressure steam***
- ***Simplified design and construction***
- ***Iron and steel construction throughout***
- ***Reduced investment***
- ***Reduced maintenance***
- ***Reduced operating manpower requirements***
- ***Reduced product cost***

Chemico Plants are profitable investments

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EUROPEAN TECHNICAL REPRESENTATIVE
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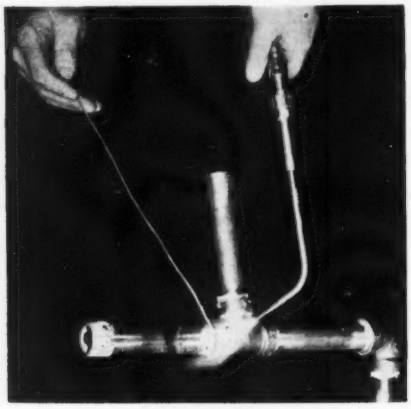
EUROPEAN LICENSEE OF N. E. C. PROCESS
HYDRO-NITRO S. A., 8 QUAI DU CHEVAL BLANC, GENEVA, SWITZERLAND

CABLES: CHEMICONST, NEW YORK

gas-fired units are available from the American Resinous Chemicals Corp.

• QB 592 Stanley G. Flagg & Co. has introduced a line of threadless brass and copper pipe or tubing, with *bronze fittings*. These threadless fittings are for



brazing to I.P.S. brass or copper base alloy tubing or pipe, and the one-piece system that results, is as strong as the pipe itself, yet easy to install at low cost. The fittings are applicable for 150 p.i pressure lines at 450° F., or 300 psi non-shock cold water, oil, or gas lines.

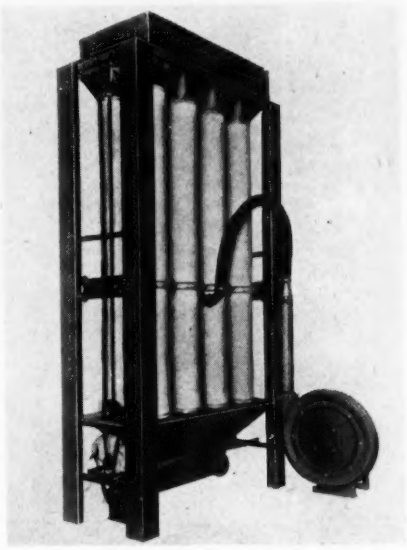
• QB 593 The Louis Allis Co. has developed a new *sanitary motor*. It is streamlined and free of cracks, recesses or depressions were food products can collect. Smaller ratings can be supplied in the totally enclosed, non-ventilated construction. Larger ratings are splash-proof and will be supplied with removable stainless steel grille plates over the cooling air inlets and outlets. All sizes can be washed down.

The entire base is enclosed by the motor housing which is finished to a flat surface. Mounting bolt holes are located in accordance with NEMA standards permitting this motor to be completely interchangeable with motors now in use. Access to the mounting bolts is through the removable grille plates.

The base design also permits the use of a built-in conduit box, eliminating the usual projecting box. Conduit may be brought into the motor through the side or bottom of the motor housing.

• QB 594 The *rotary permanent magnets* of the Multifinish Mfg. Co. are sealed in a metal tube mounted rigidly between neoprene wheels in the carrying frame. Handle is attached to frame and unit is rolled: the tube revolves with the wheels and the entire magnetic surface becomes loaded, thus providing capacity greater than when only underside of magnet can be loaded. Unloading is accomplished by pushing neoprene wiper ring to a non-magnetic area at one end, where the load drops off. "Grabbing" tanks is prevented by the wheels; and parts jump up 1 or 2 inches to the tube. The units are available in various sizes and materials. Standard wheel diameter is 2⅝", length of smallest model is 9½", larger units being 13¾", 18" and 22¼".

• QB 595 The *dust filter* of the Day Co. has the following advantages: (1) continuous-automatic operation with a minimum of cloth area, (2) constant air volume, (3) parallel air flow, and (4) no



flat surfaces or ledges within filter to accumulate dust.

Continuous-automatic operation is

RESEARCH BUILT THIS SUIT FOR THE CHEMICAL INDUSTRY

• No. 1032 Heavy Duty Rubber Surface Suit—A two piece, heavy duty suit made expressly for use in plants where resistance to corrosion is essential. Made of strong fabric, heavily coated, fully cemented seams. Entire unit vulcanized after making.

Write for catalog of Hodgman Protective Clothing

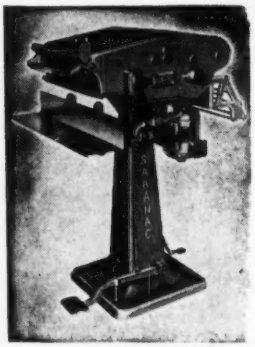
HODGMAN RUBBER CO. FRAMINGHAM MASS.

EVERY CLOSURE IS SIFTPROOF

when sealed on the D-10"

paper bags can be securely, economically, almost hermetically sealed on the Model D-10" Standard Bag Sealer. Folding and stapling operations are automatically performed at a single stroke. The resultant stapled fold is the strongest part of the bag—and it's siftproof.

Bulletin 154-C28 contains detailed information about bag sealing machines and about our inexpensive licensing plan.



Saranac Standard Model D-10

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THE OLDEST and BEST-KNOWN BRAND
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THE SHARPLES CENTRIFUGAL SOAP PROCESS

FOR THE CONTINUOUS PRODUCTION OF SOAP

Sharples is proud to announce the availability of their CONTINUOUS COUNTER CURRENT CENTRIFUGAL SOAP PROCESS. This process will continuously produce neat soap of full-boiled quality which is consistently uniform—hour after hour and day after day. A standardized product is assured which will finish to any of those grades of toilet or laundry soap now in commercial production. Any formulation of animal or vegetable fat, or other source of fatty material and rosin, etc., which is normally used by soap manufacturers may be used.

Eight years were spent in the development and perfection of this process. A commercial plant was installed in one of the most efficient and modern soap factories in the United States. This plant, operating on a twenty-four hour per day schedule, has produced many millions of pounds of neat soap. IT IS A TIME-TESTED AND PROVEN PROCESS.

Write for bulletin number 1241 which describes this process in detail.

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Greenwich Machine and Tool Co. for almost half a century builders of precision machine tools, have built the Charlotte Colloid Mill for twenty years.

We have now acquired the exclusive manufacturing and sales rights of the Charlotte Colloid Mill and proudly announce the formation of

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Exclusive Manufacturer and Distributor

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EMULSIFYING	DISPERSING	DISINTEGRATING
HOMOGENIZING	MIXING	BLENDING

REDUCTION OF PARTICLE SIZE

MODEL	CAPACITY GAL. PER HR.	HORSE POWER	MOTOR SPEED R.P.M.	FLOOR SPACE	SHIPPING WEIGHT
ND 1	1-30	1	3600	13″x35″	250
# 3	20-50	3	3600	17″x44″	450
# 7	50-100	7½	3600	19″x49″	650
#20	100-400	20	3600	24″x58″	1450
#50	400-1000	50	3600	28″x64″	2100
#75	1000-5000	75	3600	28″x64″	2500

G. M. T. COLLOID MILL CORP.

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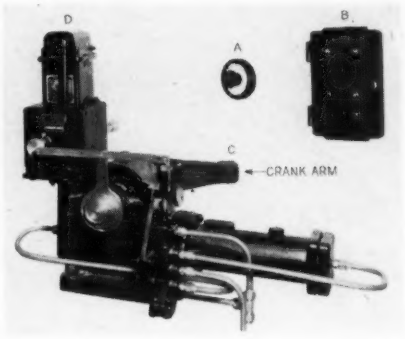
achieved by the use of slow traveling "blow-back" rings discharging high pressure air blown through the cloth tubes in a reverse direction. Maximum cloth area loss is only 1¼%. No shutdown of any portion of the filter is necessary for cleaning or rapping as the cleaning mechanism operates continuously. Units can be furnished in multiples of four tubes.

• QB 596 *Remote control of hydraulic cylinders,* operating at pressures up to 7,500 psi, is now possible. Remote control stations may be installed 1,000 feet or more



from the cylinder. Accuracy of cylinder movement of .1% is claimed by the producer, the Askania Regulator Co.

The system illustrated consists of:
(A) Station (remote transmitter)
(B) Station (transmitter & amplifier)
(C) Hydraulic crank type cylinder
(D) Receiver mounted on cylinder

The position of cylinder crank arm can be selected at either control station (A) or station (B). An electric signal for the position selected is transmitted to the receiver motor (D) which operates a pilot valve positioning the crank arm at any point within its 90° arc.

• QB 597 A new high-speed general-purpose *electronic computer* is being marketed by the Eckert-Mauchly Computer Corp. Magnetic tapes are prepared for use in the computing system by typewriter-like recorders which can be operated by any typist. The Univac then reads the tape at high speed, carrying out the instructions to rearrange the data or to perform simple arithmetic or complicated mathematical procedures with it. It employs a mercury "memory" or register which can hold as many as one thousand twelve-digit numbers.

• QB 598 Improving the seat in their check valves by the addition of a soft non-extruding *plastic valve seat* results in the valves of Hoke Inc. now being able to withstand high back pressures without danger of seat damage. These new plastic seats do not tend to fly to pieces under back pressures in excess of 1000 pounds. In spite of this capacity to withstand high pressures, these valves seal and open at low pressure differentials.

(*Continued on page* 290)

what's back of a wonder drug?

Life-saving miracle drugs such as penicillin and streptomycin must be pure—they must be absolutely uniform—and they should be produced in volume at reasonable cost. *Proper* filtration is an important factor in meeting these requirements. That's why leading drug manufacturers select the Sperry Plate Filter Press.

The popularity of the Plate Filter Press is due to the numerous advantages it offers over other types. Its ability to handle hot liquids without vaporizing, to filter without exposing liquid to the atmosphere, to use any known type of filter cloth are just a few of the reasons why it's the most widely used filter today.

The sure-cure for your filtration problem, whatever the product, is available to you. Consult an experienced Sperry engineer today . . . without obligation.

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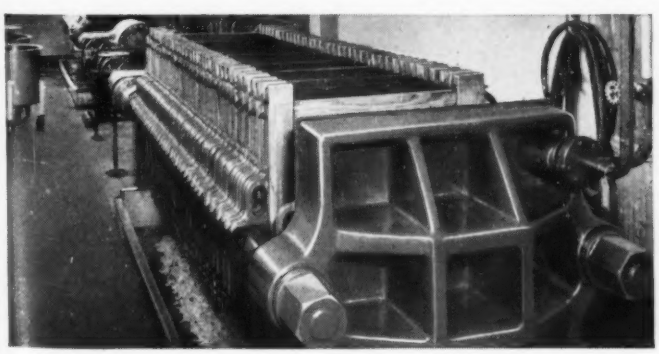


SPERRY
FILTER PRESSES

PACKAGING & SHIPPING

by T. PAT CALLAHAN

"OK On Delivery"

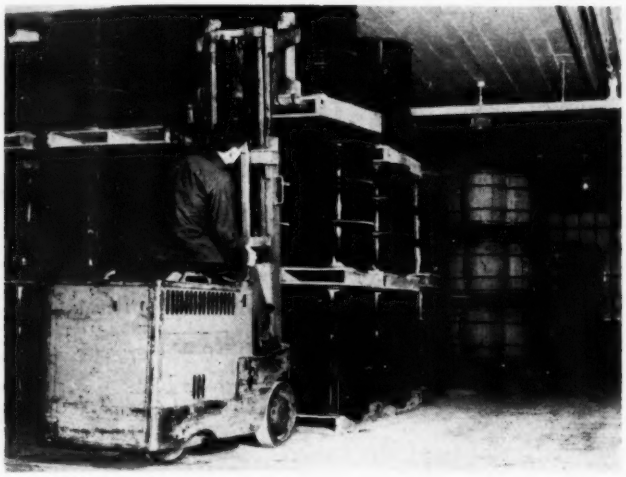
One of the most significant phrases in industry is "OK on delivery," the tell-all stamp of approval which briefly indicates that delivered merchandise has successfully weathered handling from producer through shipper to consumer. But all too frequently, according to The Shipping Container Institute, damage resulting from carelessness on the part of either the boxmaker, shipper, or carrier places burdensome and unnecessary costs on the collective balance sheet of industrial America.

In an effort to help reduce the damage costs plaguing business today, The Shipping Container Institute is currently embarked on an educational program, intended to reveal to boxmakers, shippers, and carriers the corrective action they can undertake to lessen that damage. The first to receive guidance is the shipper, for whom The Shipping Container Institute has prepared a 12-page, two-color booklet entitled "OK on Delivery." This particular booklet presents the principal damage causes that shippers are in the best position to correct, and explains how they can go about it.

Pictorially described as the seven shipping container "enemies" are: 1) uncovered freight car floor racks, which dent, crease, and rip fiberboard containers; 2) the failure to remove protruding nails, pieces of strap, lumber, or wire left in the walls and floors of the freight car from previous shipments; 3) loose loading; 4) inadequate bracing; 5) incorrect car door blocking; 6) dirty cars; and 7) poor cargo arrangement and overloading. Methods of combating these hazards are described and pictured in the booklet.

The Shipping Container Institute, organized by a group of leading fibre box

Materials Handling Solves Plant Merger Problems



When Rexall Drug Co. merged its Boston and St. Louis plants, concentrating all manufacturing operations in the latter, a forktruck unit-load system was the keystone of the solution to attendant problems: (upper left) trucks can tier palletized sacks to 12-foot height for efficient storage; (upper right) mechanical stacking permits 3 tiers of drums, one more than manual means; (lower left) 45 cartons to a pallet keep material moving from production line to finished products warehouse; (lower right) palletized load leaves hand truck at entrance of box-car door at crude stock warehouse. Storage battery-powered trucks, with noiseless operation, freedom from contaminating fumes and minimum of fire hazard can be used in all areas of plant. The system has meant savings in money, man-power, and time, and a greater storage volume and production rate.

Made for each other!

When you install a St. Regis Packaging System it's a happy marriage. For St. Regis packers and St. Regis multiwall paper bags are *designed* to work together. They eliminate many manual operations, cut down storage space, cause a sharp drop in container costs.

Nor is this a packaging system geared only to a few specialized cases. These "teams" are so flexible that they are suitable for a great variety of products. To date, over 400 commodities are being packed in St. Regis multiwalls, and the list is constantly growing.

Don't let the hidden losses of an outmoded packaging operation cut into production and profits for *you!* Discuss your needs and problems with the nearest St. Regis sales office.

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OCTOBER 12 · 13 · 14 · 15 · 16

1948

manufacturers, has been conducting research and collecting technical data pertaining to fiberboard shipping containers. The Institute of Paper Chemistry of Appleton, Wisconsin, is collaborating by providing complete laboratory facilities and an unbiased viewpoint.

"OK on Delivery," S. C. I.'s informative booklet, is being distributed through the Institute's members to their customers. Copies may also be obtained, at no charge, by addressing The Shipping Container Institute, 475 Fifth Avenue, New York 17, N. Y.

Steel Drum Upender

The Universal Drum Upending Bar marketed by Melooz Manufacturing Co., Los Angeles, Cal., is designed to make possible safe, one-man lifting of the heaviest drums. It is a solid steel tool

which utilizes the principle of leverage so that the lifting force required is only 30% of the weight of the full drum, enabling 90 pounds to lift a 300 pound drum.

The Bar hooks firmly over and under the lip of the drum in such a manner that the greater the lifting force exerted, the more firmly does the Bar hold the drum. Further, the Bar's 36-inch length keeps the man away from and clear of the drum during upending. Thus, the commonest causes of injury and accident in this work are prevented.

Seagoing Shipments Under USCG Regs

With the increase in the transportation of chemicals on board vessels, shippers should familiarize themselves with the regulations prescribed by the Commandant of the Coast Guard pertaining to explosives and other dangerous articles on board vessels published April 9, 1941, revised July 1, 1947. In the introduction to these regulations the Commandant of the Coast Guard states as follows:

> "Shippers, shipowners, operators, vessels' operating forces, and all other persons transporting, carrying, conveying, handling, storing, or stowing on board vessels subject to the requirements of R.S. 4472, as amended, and the International Convention for the Safety of Life at Sea, 1929, any explosives or other dangerous articles or substances and combustible liquids should familiarize themselves with the provisions contained herein. To this end, Coast Guard personnel concerned with the administration and enforcement of these requirements will extend every possible assistance."

It is very essential that the packaging and labeling of explosives and other dangerous articles comply with the provisions of these regulations. Anyone who exports chemicals should familiarize himself with the regulations promulgated by the Coast Guard. Copies of these regulations may be obtained from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

Celluplastic Offers Plastic Vials

Transparent plastic vials with definite advantages over glass ones have been announced by Celluplastic Corp. This type packaging is commonly used in the drug, cosmetics, tool and musical instrument accessory fields.

The new plastic vials offer packagers crystal-like transparency or gem-like colors as well as rigidity and greater durability than glass containers. At the same time it is possible to mold-in the labels in the original operation.

The vials are about 70 per cent lighter than glass ones through the use of Lustron, a polystyrene plastic made by Monsanto Chemical Co.'s plastics division.

The vials, ranging in size from ⅜ to 1¾ inches in diameter and from 1¼ to 6⅝ inches long, are more uniform in size than glass vials and therefore more adaptable to handling with automatic packaging equipment. Filling or emptying the vials is facilitated by the fact that all inside walls are smooth even where the outside walls are threaded. The vials are supplied with plug-type, friction cap, or screw-type closures.

Paper Sleeve Valve in Burlap Bag

The development of a paper sleeve valve in Bemis Rip-Cord closed burlap bags has added to the convenience and economy of the packaging operation, and increases the re-use value of these bags.

The valve burlap bags may be used on the same filling machines as valve paper bags, eliminating the need for two types of filling and closing equipment. Burlap bags fill more rapidly on the packer than paper bags, because their greater porosity permits rapid escape of air.

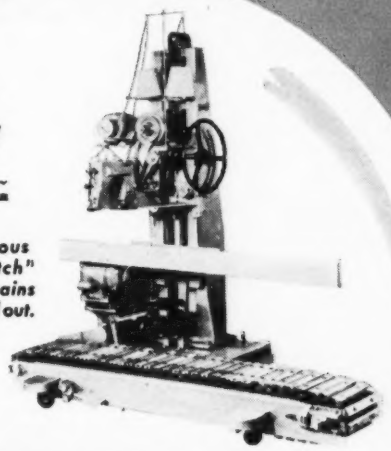
Although designed and introduced as

CALL YOUR SHOT IN CLOSURES!

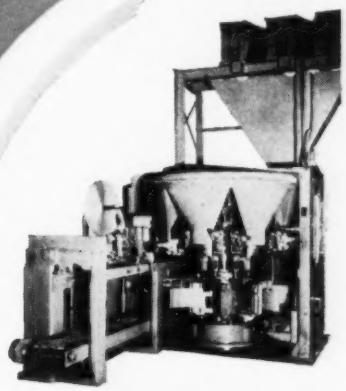
Get just the multiwall closure you need with Bagpakers.® You've a choice of merely closing bags . . . of closing and sealing them, or a complete packaging operation. Keep your existing equipment, or install one central packing point. Handle up to 45 tons per hour. You can be sure of Bagpaker dependability. Every model is ruggedly built, heavy-duty throughout, designed for hard, continuous service. Write for details on labor-saving Bagpakers.

SEWS A STURDY STITCH

It's the famous "cushion stitch" —absorbs strains and won't pull out.



E-1 BAGPAKER consists of a sewing head mounted over a conveyor and synchronized with it. Conveyor is chain-driven — no slippage. A single, two-position foot pedal controls both conveyor and sewing head.

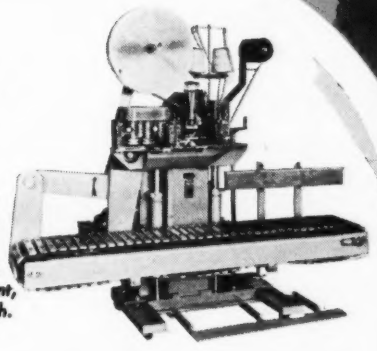


ELIMINATES MANY HAND OPERATIONS

MODEL "A" — completely automatic — extremely accurate weighing. Saves on "give away" material, labor and bag costs, thus paying for itself quickly. Machine can fill and close 100-lb. bags at the rate of 15 per minute . . . needs one operator.

APPLIES A TAPED CLOSURE

The closure is moisture-resistant, sift-proof, tough.



MODEL "DA" (portable)—one operator, filling and closing, can handle 2 to 4 100-lb. bags a minute . . . 6 to 12 a minute where filled bags are delivered to conveyor. Starting and stopping of sewing operation is automatic — no tape wasted.

BAGPAK
DIVISION

INTERNATIONAL PAPER COMPANY, Bagpak Division • 220 East 42nd St., New York 17, N.Y.

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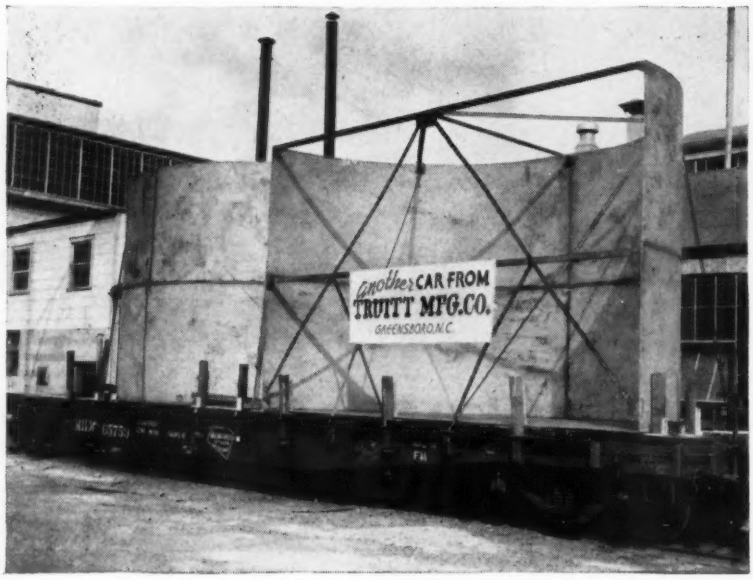
Stainless Steel

FOR

BETTER PRODUCTON



20′ x 20′ Stainless Steel Tank for *Nitric Acid Storage* in Use by TVA.

The experience of the fabricator **in choosing the proper stainless steel for your individual purpose** ***is a vitally necessary and important point*** **to consider. Properly chosen and fabricated, stainless steel is stronger . . . is non-corrosive . . . needs no painting . . . has longer earning life and lower maintenance costs.**

Truitt will fabricate tanks of any size and capacity for ***acids, caustics, dyes and special solutions.*** **Refer your requirements to us . . . our engineering services are available without cost.**

TRUITT

MANUFACTURING COMPANY

• GREENSBORO, NORTH CAROLINA •

Fabricators of Solid Stainless Steel and Stainless-Clad Tanks • Dyeing Vats • Washing Tanks • Steam Drums • Storage Tanks for Acids and Alkalis • Mechanical Agitators • Separators • Stainless Steel Trucks • And Many Other Stainless Steel Products.

fertilizer bags, indications are that these valve burlaps will find application in the packaging of many other free-flowing commodities.

Corrugated Skid

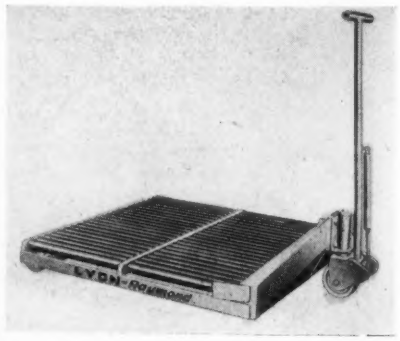
The Palmer-Shile Co., Detroit, Michigan, has designed a skid for safe, easy

handling of heavy industrial loads. It is built of heavy corrugated steel—all welded construction — for use with power lift or hand operated trucks.

Special Truck for Switching Pallets

The problem of loading pallets inside a freight car and transferring them to a roller conveyor for movement to warehouse has been solved by material handling engineers of Lyon-Raymond Corp., 4964 Madison Street, Greene, N. Y.

Empty pallets are placed on a special truck having rollers instead of a conven tional platform. This truck can be moved

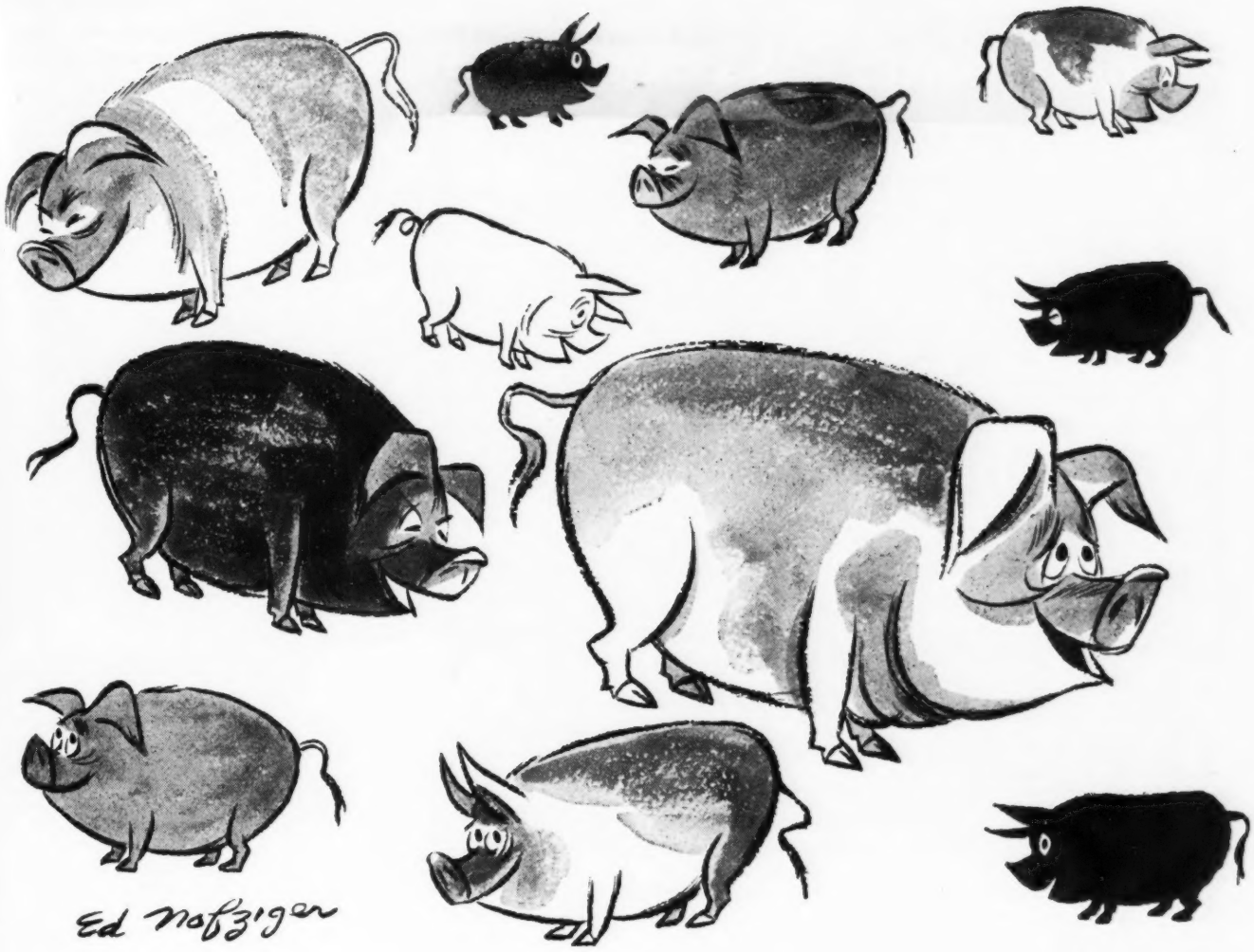


about inside a freight car or motor truck so that palletized loads can be made up from goods being received.

When the pallet is loaded, the truck is moved to the doorway where a conveyor is set up leading to the warehouse. One side of the truck is lined up with the end of the conveyor and the pallet is easily pushed on the conveyor system which carries it to the warehouse floor.

The Lyon-Raymond Pallet Switcher cuts costs since the old method of loading pallets required that the empty pallet be placed on the conveyor, and that the goods be carried to it. By use of a pallet switcher the entire loaded pallet is moved at one time.

Specifications of this truck, when designed to handle the standard 48″ pallets,



How they got 'em there without ice

. . . might also bring profits to you!

Back in the 30's, meat canners were troubled about how to get luncheon meat to customers.

It had to be kept under refrigeration after canning.

This fact naturally limited the use of the product and made things inconvenient all along the line.

Answer Needed

Now, of course, anything troubling canners troubles American Can Company, too.

So we and they set to work.

After much consultation and experiments on both our parts, a package and product were evolved which filled the bill.

The product, luncheon meat, kept without refrigeration, and was attractive when taken out of the package.

The package itself could withstand the processing needed, looked distinctive, and was easy to open.

Happy Result

Everybody was pleased . . . the consumer . . . the canner . . . and American Can Company.

This, briefly, is a success story of how a package maker like ourselves can work with a manufacturer for his greater profit.

And there are other Canco success stories, many of them. For whatever the packaging problem—whether it requires the *improvement* of an old package or the *creation* of a new one—Canco experts are used to solving them successfully . . .

. . . and have been for 47 years!

AMERICAN CAN COMPANY New York • Chicago • San Francisco

CANCO

INDUSTRIAL CHEMICALS

PARADICHLOROBENZENE
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Cable Address: PHIBROCHEM NEW YORK

include a double row of rollers on 2" centers. The top is 48" square and the truck is designed to handle loads up to 4,000 pounds.

Tongs Lift Drums

Lightweight, easy-to-operate Drum Chime Tongs to solve the problem of moving, loading and stacking drums are now being manufactured by Downs Crane & Hoist Co., 540 West Vernon Avenue, Los Angeles 37, Cal.

The Downs Chime Tongs are made

for heavy duty service and can handle all drums with or without heads from eighteen inches to twenty-four inches in diameter. The lifting arms are self-equalizing and both jaws have the same positive grip. Holding power is not affected by oily or greasy surfaces and jaws will not kink or damage the drum in any manner. Truck loading and unloading can be speeded immeasurably.

Transparent Packaging Grows

The increased selling power of rigid transparent packages, and greatly expanded fabricating capacity through equipment improvements, have caused Monsanto Chemical Co.'s plastics division to triple production capacity of its Vuepak during the last year.

During this period, equipment companies have brought out new machines, ranging from hand-operated to fully automatic ones, which have enabled manufacturers to increase efficiency of production of packages from transparent plastics. At least one machinery manufacturer is now going into production of fully automatic box-making equipment after proving test models. Electronic heat sealing, eliminating the need for hand cementing operations in the manufacture of the plastic packages, has helped take this type of packaging out of the luxury item class.

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MERCURIC ACETATE
MERCURIC IODIDE RED
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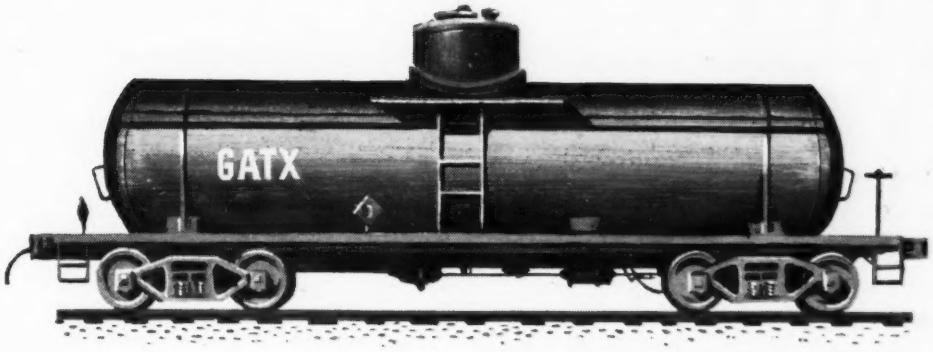
PHENYL MERCURY COMPOUND
WHITE PRECIPITATE
MERCURY CYANIDE
CALOMEL
MERCURIC BROMIDE
MERCURIC OXALATE
MERCURY OXYCYANIDE

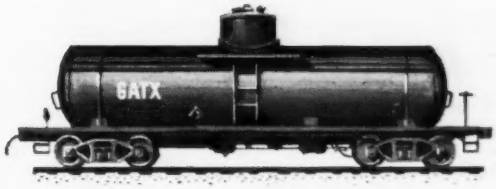
F.W. Berk & CO., INC.
WOODRIDGE NEW JERSEY
NEW YORK • SAN FRANCISCO • LONDON

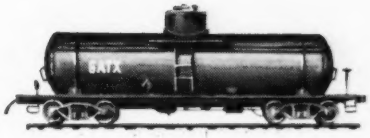
Some foreign agencies still open.



General American

is filling the gaps in the tank car supply as rapidly as possible





The GATX fleet of more than 38,000 tank cars is growing . . . growing as fast as the still-limited supply of materials permits. When we can get additional materials for building more tank cars, we will use our expanded facilities to furnish *all* our customers with *all* the tank cars they need.

GATX GENERAL AMERICAN TRADE MARK

GENERAL AMERICAN TRANSPORTATION CORPORATION

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PLANT OPERATIONS NOTEBOOK

*Tips on Backwashing Ion Exchangers**

by Joseph Thompson and Francis X. McGarvey
The Resinous Products and Chemical Co.
Philadelphia, Pa.

EFFECTIVE backwashing maintains ion exchange resin units at peak capacity by keeping the resin particles clean. To this end, the following tips are offered to help sugar refiners, brewers, vintners, candy makers, pharmaceutical manufacturers, and others.

In backwashing, the rate of up-flow of water through the exchange bed should be such that the bed expansion is at least 50%. With this expansion, the particles are scrubbed; the bed is freed of contaminants; the resin particles are reclassified so that the larger particles are found at the bottom of the bed; and channeling or packing which may cause reductions in operating efficiency are eliminated.

Effect of Temperature

Temperature of the backwash is an important factor governing bed expansion which is overlooked most frequently. Figure 1 shows how bed expansion depends on temperature and flow rate for the cation exchanger, Amberlite IR-100. This chart illustrates the problem of the operator of an installation where a pump rated to deliver 5 gal. per sq. ft. per min. at 60° F was used at 125° F. The bed expansion of 18% which resulted was insufficient and could be raised to the desired 50% only by installing a new pump that could deliver the necessary 9 gal. per sq. ft. per min. at the operating temperature.

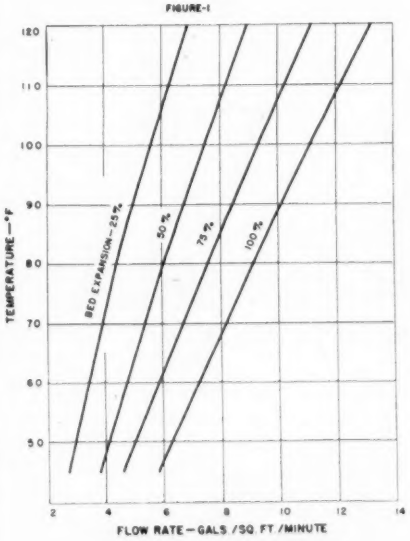
The backwash characteristics of the anion exchanger, Amberlite IR-4B, are pictured in Figure 2. Since some applications may require backwashing of the resin bed before it is completely exhausted, Figure 3 presents the data for the regenerated form of the resin. Because of the lower density and smaller size of this form, much lower flow rates are needed to achieve the desired expansion.

Bumping

When the influent to the ion exchanger contains solids that coat the resin particles, and backwashing does not scrub the particles clean, "bumping" can be used to combat a progressive reduction in exchange capacity. This procedure consists of draining the exchange unit and allowing the backwash water to surge violently through the bed, thereby scrubbing the particles vigorously and freeing them of coating. An increase in capacity of about 25% has been reported by operators in one plant who used this pro-

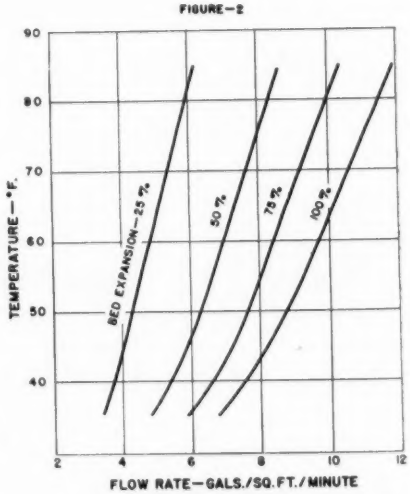
* Extracted from "Practical Aspects of Deionization" by Messrs. Thompson and McGarvey for the Eighth Annual Water Conference of the Engineers Society of Western Penna.

FIGURE-1



BACKWASH CHARACTERISTICS

FIGURE-2



BACKWASH CHARACTERISTICS
(EXHAUSTED FORM)

IF YOU BUY OR SPECIFY CORROSION-RESISTING EQUIPMENT OR CASTINGS...

Engineers and other executives who have anything to do with the purchase or specifications of pumps, valves, pipe, heat exchangers, steam jets, and other corrosive-handling equipment will find this guide an invaluable aid.

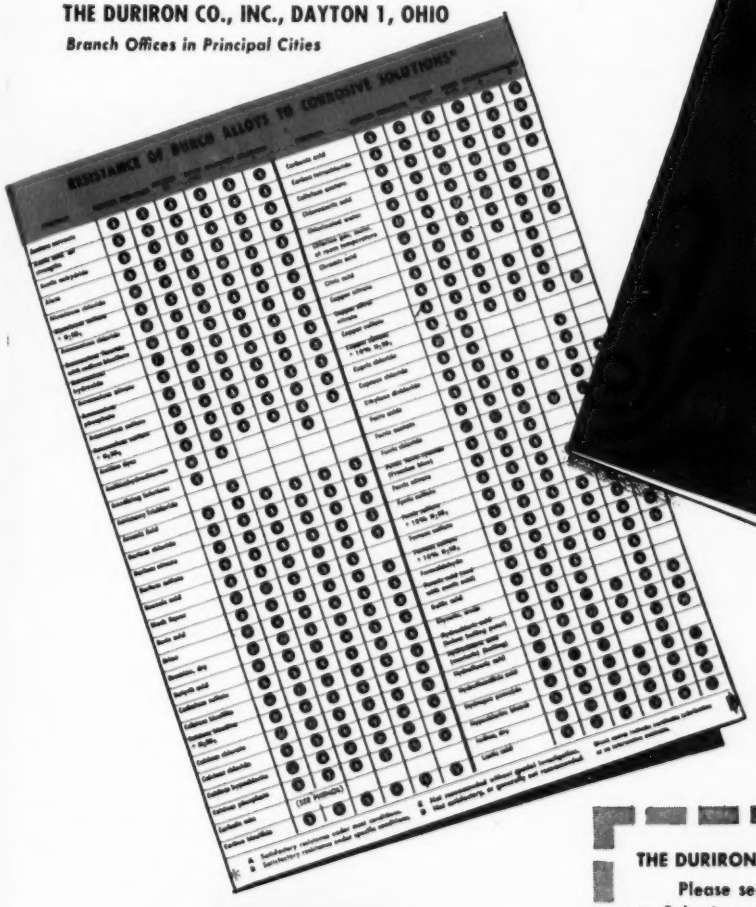
Listing 155 corrosives in alphabetical order, it shows which of five well-known DURCO alloys offers most satisfactory resistance to each corrosive. Where two or more alloys are satisfactory for a particular service, selection can be made on the basis of the most economical alloy possessing the required mechanical properties, as shown in a table on page 2.

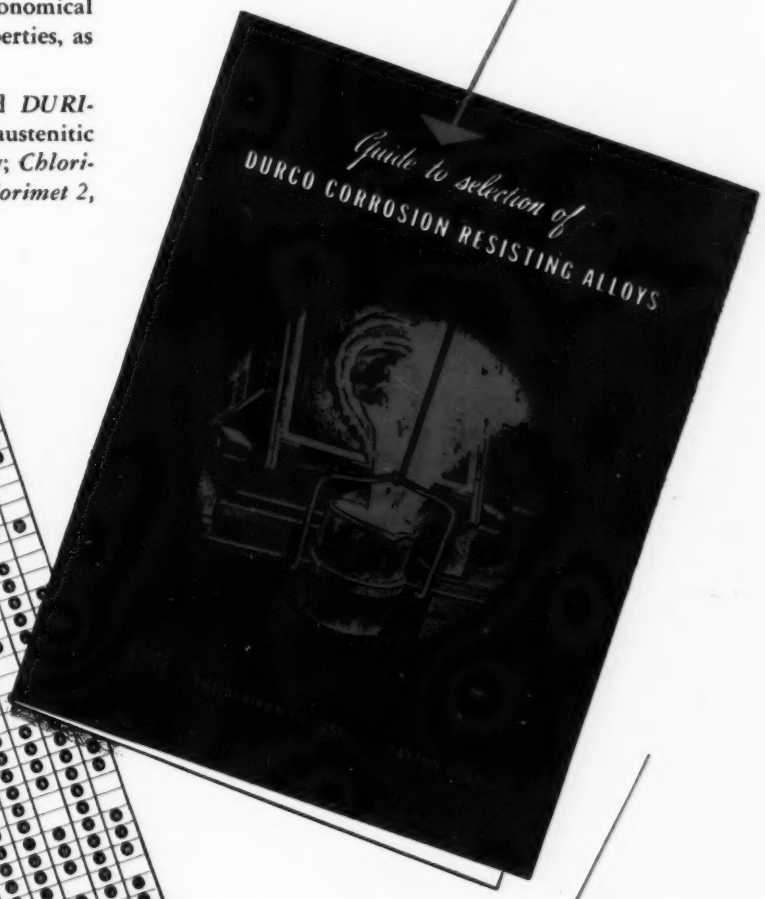
The alloys discussed are: *DURIRON* and *DURICHLOR*, high silicon irons; *DURIMET 20*, an austenitic stainless steel; *DURCO D-10*, nickel-base alloy; *Chlorimet 3*, nickel-molybdenum-chromium; and *Chlorimet 2*, a nickel-molybdenum alloy.

THE DURIRON CO., INC., DAYTON 1, OHIO

Branch Offices in Principal Cities

you should have a copy of this NEW bulletin





For your free copy of this new bulletin, just fill out the coupon and drop it in the mail.

THE DURIRON CO., Inc., Dayton 1, Ohio

Please send me, without obligation, a copy of your new "Guide to Selection of Durco Corrosion Resisting Alloys."

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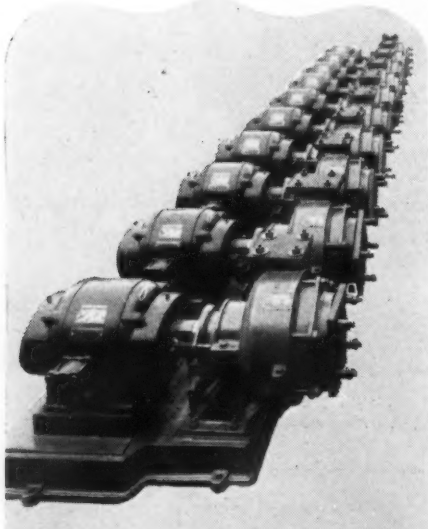
46-GM

The Series 697 Centrifugal Acid Pump will handle all liquid corrosives except fluorides and hot caustics. No metallic contamination of solutions is possible as all parts coming in contact with liquids are made of Ceratherm-500, heat-shock-resistant chemical stoneware. The dense, strong, non-porous ceramic body is protected against mechanical damage by a heavy cast iron outer housing. The outer housing is protected with Tygon Paint.

The Series 697 Pump is available in either belt-driven or motor-driven styles, in four sizes with GPM capacities ranging from 30 to 600.



Write for Bulletin 702P

U. S. STONEWARE
Akron 9, Ohio

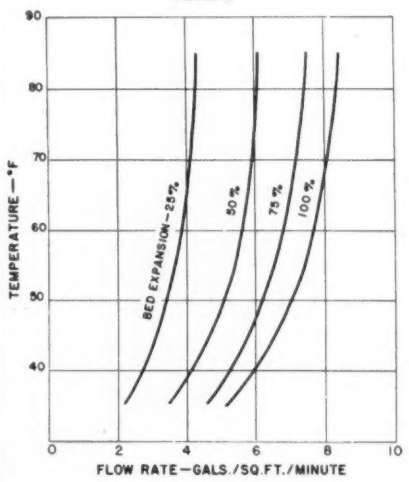
cedure in the middle and at the end of the exhaustion cycle.

With influents to the exchanger containing a high proportion of suspended solids, it is becoming rather common practice to use surface washers of the type employed in filter units. In one larger plant the increase in capacity resulting from the installation of surface washers in one exchange system has prompted their specification in all other exchange systems.

Control of Microorganisms

Contamination of exchange units by the microorganisms presents a more difficult problem. The efficiency of Amberlite IR-100 in one case was markedly reduced by algae in the feedwater. The organism formed a crust on the surface of the resin bed, which resulted in excessively high head losses. Cracking of this crust led to channeling, premature breakthrough of ions, and a reduction in the operating cycle. Chlorination of the influent in concentrations of about 2 ppm effected lower head losses, longer cycles, and less frequent backwashing without altering the chemical or physical properties of the exchanger.

FIGURE-3



BACKWASH CHARACTERISTICS
(REGENERATED FORM)

In another case, difficulty was encountered with iron-consuming microorganisms, probably introduced in the backwash water. The addition of 5 ppm chlorine in the backwash water eliminated the objectionably-high head losses caused by clogging of the under-drainage system.

Since organic-type exchangers absorb high concentrations of chlorine, it cannot be used to sterilize the exchange beds of the bottling, pharmaceutical, beverage, and food industries. However, the development of a sterilizing reagent that gives every indication of killing bacteria without affecting the resin-type cation and anion exchangers is understood to be well in progress.

Safety Dial

The new safety aid dial of the Davis Emergency Equipment Co., Inc., 45 Halleck St., Newark 4, N. J., is a ready reference for many of the daily hazard problems. The operation side of the dial covers:

1. 45 different mechanical operations in industry
2. Suggested head, eye and face protection for each operation
3. Body protection for each operation
4. Respiratory protection for each operation

The substance side lists 55 different fumes, vapors, gases, dusts, etc. and gives the following information about each.

1. Probable safe concentration for an 8 hour exposure
2. Suggested protection and control measures
3. Usual method of entrance to the body
4. Flash point
5. Lower explosive limit

There are in addition a canister color chart and a listing of the uses and limits of gas protective equipment.

NOMOGRAPH-OF-THE-MONTH

Edited by DALE S. DAVIS

Readers are invited to submit for publication in this department any original nomographs pertaining to chemistry or engineering. $10 *will be paid for each one used.*

Nomograph for Determination of the Thermal Conductivity of Liquids

by D. S. DAVIS
Government Laboratories,
University of Akron, Akron, Ohio

IN the design of chemical engineering equipment there is frequent need for reliable estimates of the thermal conductivities of various liquids. Such estimates can be made by means of an equation recently given by Palmer[2]:

$$k = 22.9 \frac{\rho^{4/3} Cp}{(Tr)\, M^{1/2}}$$

where k = thermal conductivity,
(B.t.u.)(ft.)/(hr)(sq.ft.)(°F.)
ρ = density, grams/cc.

For Simplicity, Ease of Control and High Yield in Organic Syntheses

Try Hooker Sulfuryl Chloride—

Sulfuryl Chloride has great potentialities in organic synthesis for these reasons: (1) reactions are simple (2) they are easy to control (3) excellent yields generally result (4) no special equipment is needed (5) a variety of reactions is possible.

Chlorination of Aromatics and Aliphatics

Sulfuryl Chloride reacts with both aromatic compounds and aliphatic compounds to form many interesting compounds. Advantages of sulfuryl chloride as a chlorinating agent are:

1. The heat of chlorination using sulfuryl chloride is far less than that using elemental chlorine.
2. It is possible by using different catalysts, reacting at different temperatures and by carefully controlling proportions of reactants to chlorinate selectively.

Sulfonation of Aromatic and Aliphatic Compounds

By varying the conditions of reaction, sulfuryl chloride can be used for sulfonation of the aromatic nucleus. Sulfuryl chloride derivatives of benzene, toluene, xylene, mesitylene are some of the products obtained.

The introduction of the sulfuryl chloride group into aliphatic compounds is accomplished in the presence of light and a suitable cataylst. A rapid vigorous reaction occurs with the formation of alkyl sulfonyl chlorides and yields as high as 70% are reported.

Acylation

Aliphatic alcohols react with sulfuryl chloride to form chlorsulfonates and with an excess of alcohol the reaction may proceed to form dialkyl sulfate or alkyl sulfuric acid.

Similar reactions take place with aliphatic amines and under proper conditions it acts as an acylating agent with aromatic amines.

Literature on this versatile chemical also reports the formation of acid anhydrides and chlorides and esters.

Hooker Sulfuryl Chloride is a particularly pure product with a 99% minimum sulfuryl chloride content. Additional information on Hooker Sulfuryl Chloride is available in Hooker Technical Data Sheet 717, Hooker Bulletin 328A, "Chlorinating Agents" and Bulletin 330, "Sulfuryl Chloride in Organic Chemistry." Write for copies on your business letterhead.

HOOKER RESEARCH Presents

BENZOTRIFLUORIDE
(Trifluoromethylbenzene)

Molecular Weight	146.1
Freezing Range	−28.5° to −29.5° C
Boiling Range (ASTM, 98%)	2.5° including 101° C
Specific Gravity 15.5°/15.5° C	1.197
Refractive Index n20/D	1.4145

This new product of Hooker Research is another of the fluorides whose properties indicate its usefulness as a chemical, dyestuff, and pharmaceutical intermediate, as a solvent or dielectric fluid and in the manufacture of bactericidal products.

Benzotrifluoride is a colorless aromatic liquid. Its thermal stability is excellent, the CF_3 group not being attacked at 350° C in the presence of iron or copper. It is completely miscible with most common solvents. The trifluoromethyl group is strongly meta directing.

Hooker benzotrifluoride is at present available in pilot plant quantities. Technical Data Sheet No. 350A describes more completely its physical and chemical properties. Please use your company letterhead when requesting sample or literature.

HOOKER ELECTROCHEMICAL COMPANY

HOOKER CHEMICALS

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SOURCES OF INFORMATION for INDUSTRIAL MARKET RESEARCH

★ **With Special Reference to the Chemical Process Industries**

Edited by
RICHARD M. LAWRENCE

You readers of Chemical Industries asked for this. You wrote us many letters requesting that we reprint our series on information sources for chemical market research and we are glad to be able to announce that the book is now off the press.

The 104-page reprint contains all of the material in the original series: detailed listings of services and publications of the various U. S. and Canadian government departments, state publications, independent trade data sources, also how to classify and interpret chemical market data and other valuable information for persons engaged in market research in the process industries. Use the handy form below to order your copy now.

Please send —— copies of "Sources of Information for Industrial Market Research" at $2.50 each. My remittance is enclosed. (Include 5c per copy sales tax for N. Y. City addresses.)

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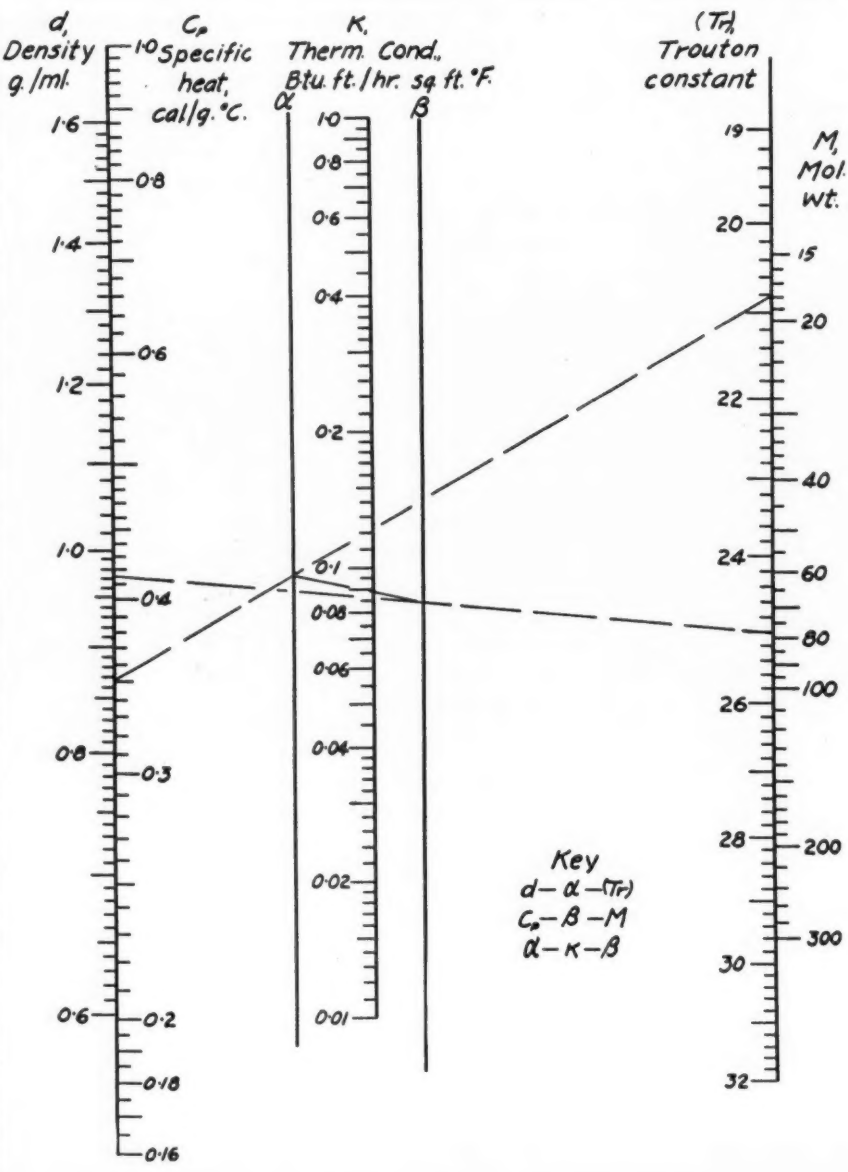
CHEMICAL INDUSTRIES, 522 5th Ave., New York 18

Cp = specific heat, (gram-cal.)/(gram)(°C.)
(Tr) = Trouton's constant (entropy of vaporization)
M = Molecular weight.

The equation, which holds within an average of about 9 per cent for 48 liquids of industrial importance, can be solved readily by means of the accompanying nomograph which was constructed by methods described previously[1].

The use of the chart is illustrated as follows: What is the thermal conductivity, in English engineering units, of benzene which has a density of 0.868 gram/cc., a specific heat of 0.416 (gram-cal.)/(gram)(°C.) a Trouton's constant of 20.81 and a molecular weight of 78.1? Following the key, connect 0.868 on the d scale with 20.81 on the (Tr) scale and note the intersection with the α axis. Connect 0.416 on the Cp scale with 78.1 on the M scale and note the intersection with the β axis. Connect the α and β intersections and read the desired value on the k scale as 0.089 (B.t.u.)(ft.)/(hr.)(sq. ft.)(°F.).



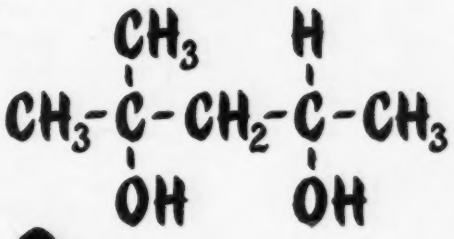
LITERATURE CITED

(1) Davis, D. S., "Empirical Equations and Nomography", Chap. V, New York, McGraw-Hill Book Company, 1943.
(2) Palmer, Gerald, Ind. Eng. Chem., *40*, 89-92 (1948).

Eye Conservation

The National Safety Council points out that a prime factor in avoiding eye injuries among workers is the encouragement of the wearing of goggles. To this end it is essential that the goggles supplied be properly fitted and adjusted. It has been found that though cup-type gogles provide more protection than the spectacle-type with side-shields, the men do not wear the former whereas they do the latter; thus the latter actually afford better protection.

From SHELL CHEMICAL



Hexylene Glycol

A new plant at Houston, Texas has greatly increased the supply of this vaiuable solvent

PROPERTIES

Molecular Weight	118.17
Specific Gravity 20°/4°C	0.9216
Boiling point (760 mm.)	198.27°C
Flash Pt., Cleveland Open Cup	230°F
Vapor Pressure at 20°C	0.02 mm. Hg
Refractive Index, n_D^{20}	1.4276
Viscosity at 20°C	41.7 centistokes
Weight (pounds per gal. at 20°C)	7.69

Among the many other Shell Chemical products are Tertiary Butyl Alcohol, Diacetone Alcohol, Allyl Alcohol, Diisobutylene and Acrolein

A data sheet and sample will be forwarded on letterhead request. Write your nearest Shell Chemical office.

HEXYLENE GLYCOL is a colorless, nearly odorless dihydric alcohol which is miscible with water and an unusually large number of dissimilar chemicals.

AS A COUPLING AGENT it offers distinct advantages in the formulation of *hydraulic brake fluids* because of its water tolerance, lack of rubber swell and compatibility with castor oil in all proportions. In addition, its chemical stability, viscosity index, lubricating properties and non-corrosiveness are equally satisfactory. HG is also widely used as a coupling agent and emulsion stabilizer in *engine cleaning compounds* and *"soluble" cutting oils.*

AS A SOLVENT its steep vapor pressure curve, good resin solvency and comparatively mild hygroscopicity make it particularly useful in the manufacture of "flash dry" and other types of *printing inks.*

AS A PENETRANT its mildly hygroscopic character, plus notable softening and coupling properties, suggest its use as a component of *yarn lubricants, mercerizing assistants and other textile chemicals.*

SHELL CHEMICAL CORPORATION

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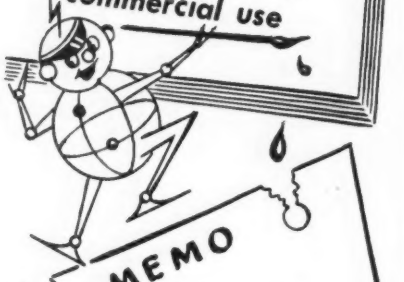
MEMO

A Stable Amide for ORGANIC SYNTHESES

Lithium Amide

Now in full-scale commercial use



MEMO

*APPLICATIONS

The stability of Lithium Amide, as compared to other amides, makes it absolutely *safe* to ship, handle and store. For numerous organic reactions, Lithium Amide is a convenient and instantly-available reagent. And in certain reactions, it produces a higher yield.

EXAMPLES

1. Claisen condensations.
2. Alkylation of nitriles and ketones.
3. Syntheses of ethinyl compounds and acetylenic carbinols.

MEMO

$LiNH_2$ PROPERTIES

Molecular Wt.: 22.964
Melting Range: 380-400° C.
Density: 1.178 g./cc. at 17.5° C.
Heat of Formation: 42.6 kilocal./g. mol. at 18° C. and 1 atmosphere
Solubility:
pure ethyl ether } Insoluble
benzene
toluene
water, hot or cold decomposes

$LiNH_2 + H_2O \rightarrow LiOH + NH_3\uparrow$

Lithium Amide (Lump or powder)
Lithium Metal (Lump, wire or sand form)
Lithium Hydride

Write for information.

METALLOY CORPORATION
Rand Tower Minneapolis, Minn.
DIVISION LITHIUM CORPORATION OF AMERICA, INC.

New Equipment

(*Continued from page 274*)

• QB 599 A new series of Chromalox heavy-duty *electric heaters* for super-heating steam and pre-heating gases used for drying, vacuum packing, and other applications requiring dry heat, is available from Edwin L. Wiegand Co. 750° F. is rapidly reached and accurately maintained by thermostatic controls. Three sizes are available: Series 2 with 2″ standard pipe, Series 3 with 3″ standard pipe and Series 6 with 5″. Capacities range from one to 12 kw.

Chromalox pre-heaters and super-heaters are available for 115, 230, 460 and 550 volts. Series 2 is for single-phase operation only. Series 3 and 6 may be wired for single or 3-phase.

• QB 600 Automatic shut-off upon disconnection and instantaneous flow upon connection is the important feature of a new series of Roylyn *quick couplings* known as the 1300 series.

This coupling is noteworthy because it combines automatic sealing with the Roylyn quick-disconnect principle.

The 1300 coupling is available with the valve in either or both halves of the coupling. It is available in sizes from ¼″ to 2″ and in Dural, bronze and steel. It is vibration-proof and incorporates a full swivelling action that prevents kinking of the hose.

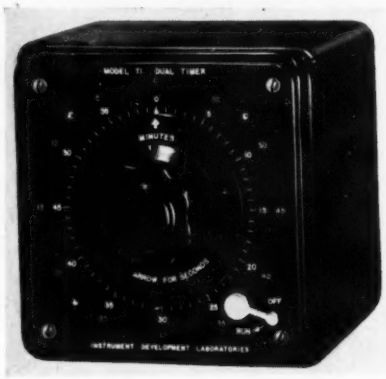
• QB 601 A new *metering pump* unit produced by the Mechanical Products Corp. is not affected by a wide change in temperature or viscosity. A check valve arrangement insures instantaneous discharge of the fluid and prevents dripping or leakage when pump motor is not operating. Stainless steel (18-8 type) and pure carbon are used.

It has a capacity of 10 c.c. per second. The unit is powered with a 1/35 HP shaded pole induction motor, 4 poles suitable for intermittent duty without fan, 115 volt, 60 cycle, single phase. The unit fits into a space 4″ square by 6½″ long and weighs 7 pounds.

• QB 602 The Condersite Engineering Corp. has produced a new all-purpose waterproof *lagging* that is quickly and easily applied without rivets, bolts, or heat, and dries within 10 hrs. at room temperature. It adheres firmly to surfaces and is weather and corrosion resistant.

The lagging eliminates belt slippage and is equally suitable for crown, split and flat pulleys—for use with leather, cord, wire-woven, or rubber belts. Units consist of 70″ x 40″ treated fabric and sufficient compound for application, cut to size for any pulley, or in rolls of any width up to 42 inches.

• QB 603 A nelw, extremely precise *due timer,* which will either break an electrical circuit after a pre-set number of minutes and seconds, or will show elapsed time for an operation, has just



been marketed by Instrument Development Labs. This new Model T1 timer can be set for any period of time from two seconds to 60 minutes. Time values as small as ¼ second can be accurately controlled by interpolation.

• QB 604 United States Rubber Co. is putting *nylon* plastic on electrical wire forming a hard *shell* over the rubber insulation, giving the conductors better protection. The wire is 30% smaller in diameter than conventional building wire.

Under the nylon are two layers of insulation—natural rubber and neoprene synthetic rubber. Resistance is claimed to gasoline, oil, fire, moisture, acids and light. The wire will be marketed under the name Neolay Type RU in sizes 14, 12, 10, 8 and 6.

• QB 605 The construction feature of the new *sheave* of the American Pulley Co. is the rubber-lagged hub upon which the sheave flanges are mounted. Bonded to the steel hub of the sheave, the rubber section eliminates freezing by acting as an insulating cushion between the flanges and the hub of the sheeve. The sheaves are made in two and three grooves with pitch diameter variation of 5.25″ to 10.0″ providing four to five times the speed variation available with standard adjustable-diameter sheaves. The adjustment for speed variation is made while the drive is stationary. They are designed to utilize multiple "R" section V-belts. They will handle loads up to 15 HP.

Cowles Chemicals

DRYMET*

the economical detergent silicate

Write for **DRYMET* FILE FOLDER** containing complete technical information.

PROMPT SHIPMENTS — one package or a carload.

DRYMET is anhydrous sodium metasilicate. On the basis of both Na_2O (alkalinity) and SiO_2 (silicate) it is more economical to use than other types of hydrated or anhydrous detergent silicates.

DRYMET contains no water of crystallization. It is readily soluble in all practical concentrations at all practical temperatures. DRYMET has a total alkalinity as Na_2O of not less than 51%. It yields a pH of 11.95 in a 0.1% solution.

CRYSTAMET* — Cowles Sodium Metasilicate, pentahydrate, is also available for immediate shipment.

*Reg. U. S. Pat. Off.

The Cowles Detergent Company

HEAVY CHEMICAL DEPARTMENT

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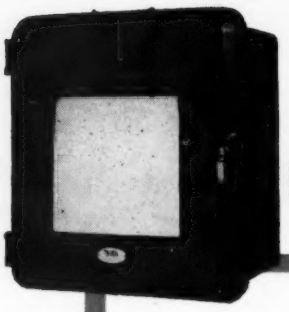
A NEW BECKMAN INSTRUMENT . . .

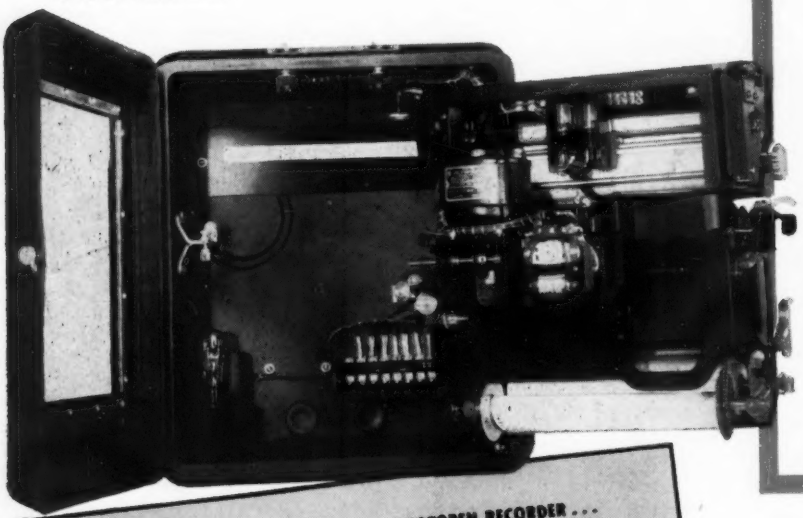
The Photopen RECORDER

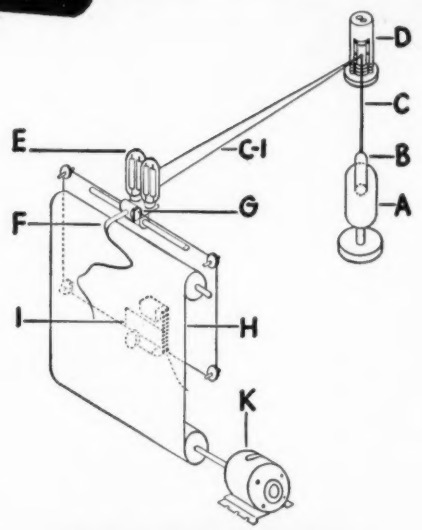


A Unique High-Speed Light Beam Recorder Based on Original Pompeo-Penther Design*

The Photopen Recorder is an important advancement which provides direct high-speed pen recording of light beam deflections. A light beam entering through a slit in the back of the recorder case strikes a unitized photocell-pen assembly. As the light beam moves, the photocell-pen assembly shows the movement, producing an accurate ink trace of the positions of the light beam. As little as 0.1 mm deflection causes a corresponding movement of the pen on the strip chart.

The Photopen offers many advantages, including high sensitivity, fast response, and unusual convenience for a variety of applications in which the position of a moving light beam is to be recorded.





OPERATING PRINCIPLE OF THE BECKMAN PHOTOPEN RECORDER

The basic operating principle of the Beckman Photopen Recorder is shown in the schematic drawing above. A light beam (c) projected from the light source (a) through the lens (b) to the galvanometer mirror (d) is deflected from the mirror through a slot in the back of the Recorder case where it strikes twin photo-tubes (e) and through an amplifier controls and operates the reversible motor (i). When the deflected beam (c-1) deflects to the left photo-tube cathode, the pen carriage (g), mounting both the photo-tubes and recording pen (f), moves to the left. When the beam deflects to the right photo-tube cathode, the pen carriage assembly moves to the right. When the beam (c-1) is centered between the cathodes, the pen carriage assembly remains stationary. Recording chart (h) is turned at a uniform rate of speed by the drive motor (k) throughout the entire operation, thus permanently recording beam fluctuations.

UNIQUE FEATURES OF THE BECKMAN PHOTOPEN RECORDER . . .

EXTREME SENSITIVITY. The Photopen Recorder requires only a weak intensity light beam for completely satisfactory operation, and deflections as small as 0.1 mm are instantly detected and recorded.

HIGH RESPONSE SPEED. The Photopen Recorder provides extremely high response speeds — as fast as 1½ seconds across the chart — with no "hunting" or oscillation of the pen.

CONTINUOUS RECORD. The Photopen Recorder records every movement of a galvanometer or other type mirror instantly, accurately and continuously.

VISIBLE RECORDING. The record obtained with a Photopen Recorder is immediately visible throughout the progress of any experiment — with none of the delay or inconveniences encountered in photographic development processes.

MAXIMUM CONVENIENCE. The Photopen Recorder can be operated in any laboratory, and requires no special facilities or mounting provisions. Ordinary room illumination does not interfere in most cases.

**D. J. Pompeo and C. J. Penther, Rev. Sci. Inst., 13, 218, (1942).*

THERE ARE MANY VALUABLE APPLICATIONS FOR THE PHOTOPEN RECORDER

The Photopen answers the need for a highly sensitive, convenient recorder for such applications as determining differential temperatures between opposing thermocouples such as in thermal analysis work . . . recording current-voltage curves in polarographic analyses . . . recording ion currents in mass spectrographic work . . . recording galvanometer deflections in infra-red spectrophotometry . . . recording deflection of torsion balances, including film balances as used in determining surface tensions . . . recording deflections from strain gauges for measuring beam deflections . . . recording progress and results of tests run on certain types of profilometers . . . recording mirror deflections in radiometers and certain types of microphotometers.

BECKMAN

The Photopen Recorder is another in the extensive line of Beckman Instruments for modern research and industrial control operations. Write for full details. *Beckman Instruments, National Technical Laboratories, South Pasadena 17, California.*

INSTRUMENTS CONTROL MODERN INDUSTRIES

pH Meters and Electrodes — Spectrophotometers — Radiation Meters — Special Analytical Instruments

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CHLORINATED BENZENES

MONOCHLOROBENZENE

ORTHODICHLORO-BENZENE

PARADICHLORO-BENZENE

TRICHLOROBENZENE

Heyden chlorinated benzenes (benzols) are widely used in organic syntheses and have extensive applications in the manufacture of solvents, insecticides, textile chemicals, medicinals, weed killers, polishes, explosives, soil and sewage disinfectants, protective coatings, and many other industrial and commercial uses.

AVAILABILITY

Heyden Chlorinated Benzenes are shipped in seller's cars from our plant at Memphis, Tennessee: Tank cars, approx. 74,000 lb.; drums, approx. 475 lb.

ORTHO-DICHLORO-BENZENE

This extremely versatile Heyden chlorinated benzene is in constant demand for the manufacture of petroleum products, metal polishes, soil disinfectants, automotive and industrial solvents . . . for sewage treatment, fumigants, dry cleaners, paints and surface coatings . . . and for wool scouring, gas purification, termite control and leather dyeing.

PROPERTIES

Appearance	Clear, colorless, heavy liquid
Odor	Characteristic, pleasant, aromatic
Boiling Point	180°C.
Freezing Point	−17° to −22°C.
Specific Gravity 25°/25°C.	1.303
Flash Point (closed cup)	160°F.
Solubility	0.01 g./100 g. water at 25°C.; Slightly soluble in alcohol; Miscible with most other organic solvents
Containers	Tank cars, approx. 86,000 lbs.; 55 gal. drums—550 lbs. net

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HEYDEN *Chemical Corporation*

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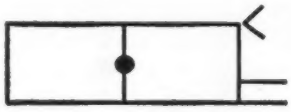
CAMPHENE

now available in tank cars or drums!



CAMPHENE

C_{10} H_{16}

THE GLIDDEN COMPANY announces the addition of Camphene to its series of terpene chemicals including Alpha Pinene, Beta Pinene and Dipentene that are now being produced on a commercial scale at its Naval Stores Plant in Jacksonville, Florida. Glidden Camphene is available in drum and tank car quantities, marking the first time that this interesting and reactive product has been freely offered in large volume and high purity in the United States.

Camphene is suggested as a raw material for the manufacture of plasticizers and synthetic essential oils. Its high chemical reactivity makes possible its application in the synthesis of novel and useful products.

For further information and samples write:

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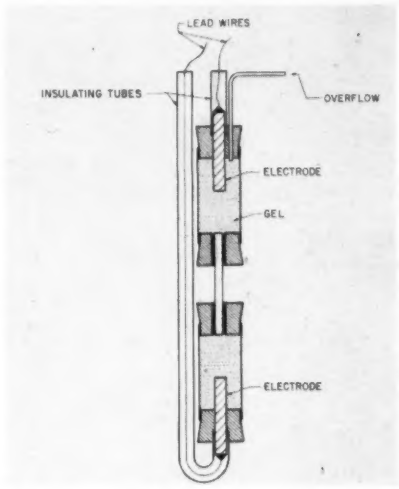
QUALITY Glidden PRODUCTS

LABORATORY NOTEBOOK

Conductivity of Viscous Materials

A new type of conductivity cell developed by Dr. Earl Otto of the National Bureau of Standards, Washington 25, D. C., with some alteration of cell dimensions, is expected to be very useful in measuring the conductivities of pastes,



glues, viscous aqueous solutions, aqueous cement suspensions, pigment slurries, clay suspensions, moistened soil, and other materials. Suggested applications lie in the textile, plastic, and soap industries and in the manufacture of adhesives, batteries and ceramics.

The electrodes are made of graphite impregnated with paraffin oil. The reservoirs of electrolytic material surrounding each electrode are separated by a small-diameter tube that also contains some of the electrolytic material in order to obtain a cell with a satisfactory constant for use with strong concentrations of highly conductive salt solutions. The apparatus may be used in conjunction with any of the usual methods of measuring electrolytic resistances. Reproducibility has apparently been limited mainly by the bridge that is used. However, duplicate sets of data have been found to check within 0.2 per cent.

Color Analyzer

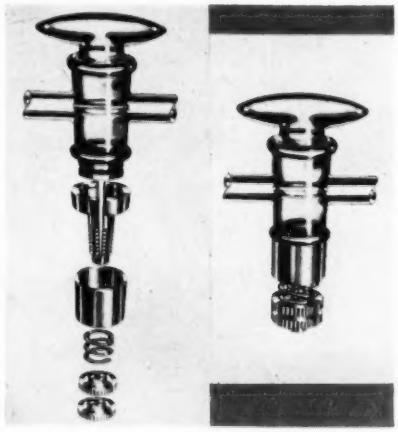
A new machine which can tell blue from blue and red from red has been developed by the Ansco Division of the General Aniline & Film Corp., Binghamton, N. Y. Although designed primarily for photographic work, the instrument, known as the Ansco Color Densitometer, can be adapted to scores of other uses in many other fields such as measuring or matching colors in textile, paints and dyes, and in medical research.

The present design, which provides for accurate measurement of color densities at single wave lengths (blue, green, red) as well as black and white densities of transmission as low as one part in a million, employs a new patented logarithmic electronic circuit.

Only one microlumen is required to produce a full scale reading on the large and uniformly calibrated scale. This high sensitivity also permits the use of extremely small apertures, such as are used for micro-densitometry, and also provides the sensitivity required to measure color densities up to 3.0 and higher with the standard 3 mm aperture plate. Sharp cutting filters transmitting at 436 millimicrons, at 546 and 644 millimicrons are housed in the measuring arm. Black-and-white densities up to 6.0 may be measured by merely rotating the filter selector knob. The instrument is said to be accurate to approximately 0.02 over the entire density range. The desired stability is secured by the use of a dynode voltage feed back circuit. Room illumination has no effect on the instrument's operation, thus subdued light conditions are not required.

Laboratory Equipment

• The new stopcock adapter by the Emil Greiner Co., 161 Sixth Ave., New York, is designed for use with any ordinary glass stopcock. Machined from a

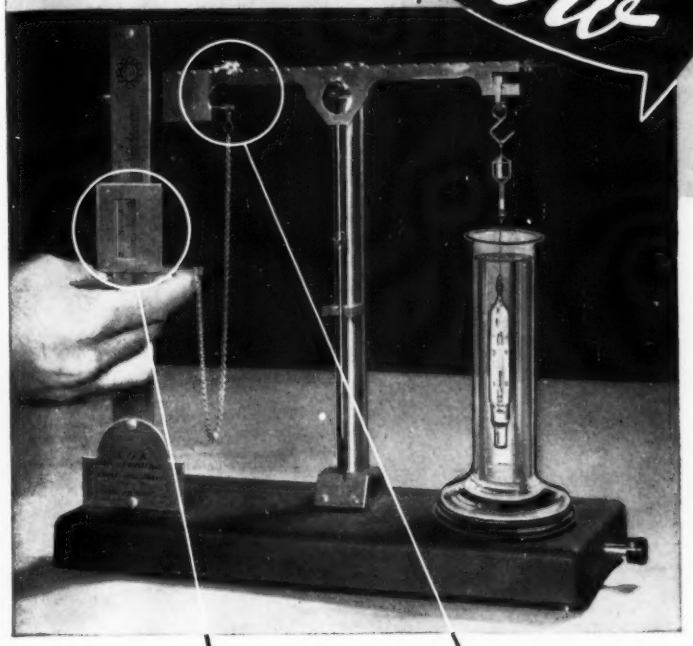


special aluminum alloy, the new Hamilton Stopcock Adapter will effectively resist corrosion in practically all laboratory atmospheres. This new device will aid laboratory workers who require pressure stopcocks, vacuum-tight stopcocks, and leak-proof stopcocks for burets, gas sampling, and measuring apparatus.

• The Gyco-Phen electronic temperature control of the Scientific Glass Apparatus Co., Bloomfield, N. J., regu-

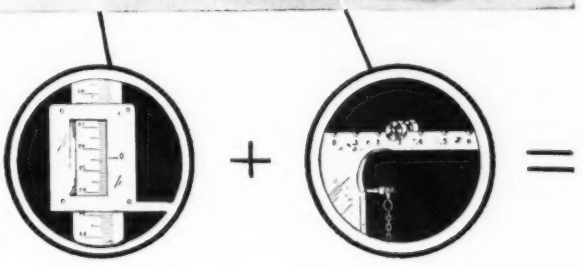
Now

Specific Gravity at a Glance



with the

E. & A. CHAIN GRAVITOMETER



Direct Readings within ±0.0005

The Eimer and Amend Chain Gravitometers combine the principle of plummet displacement with the speed of chain weighing to afford rapid, *direct* and accurate specific gravity readings.

These T-type balances have just one roller weight and are simple to operate. The sensitivity is .001 Sp.G., and readings to the fourth decimal place can be made with little practice. No calculations are required in the determination of liquid samples up to a specific gravity of 2.11.

After an E.&A. Chain Gravitometer is prebalanced, the 10 gram plummet of the Gravitometer for liquid specific gravity determinations is immersed in a 100 ml. sample and the Gravitometer is again brought to balance. The sum of the readings of the chain slide and rider—as illustrated above—equals the specific gravity of the liquid sample.

The glass basket illustrated at the right is furnished with the Gravitometer model for work with both liquids and solids. It is substituted for the plummet to measure specific gravity of solids. Calculations involve only four simple steps and the same accuracy as with liquids is provided.

Two Models Available

E.&A. Chain Gravitometer, with plummet, sample cylinder and glass basket for both liquids and solids, **$140.00**

E.&A. Chain Gravitometer, with plummet only, for determining the specific gravity of liquids, **$130.00**

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EIMER AND AMEND
Greenwich and Morton Streets
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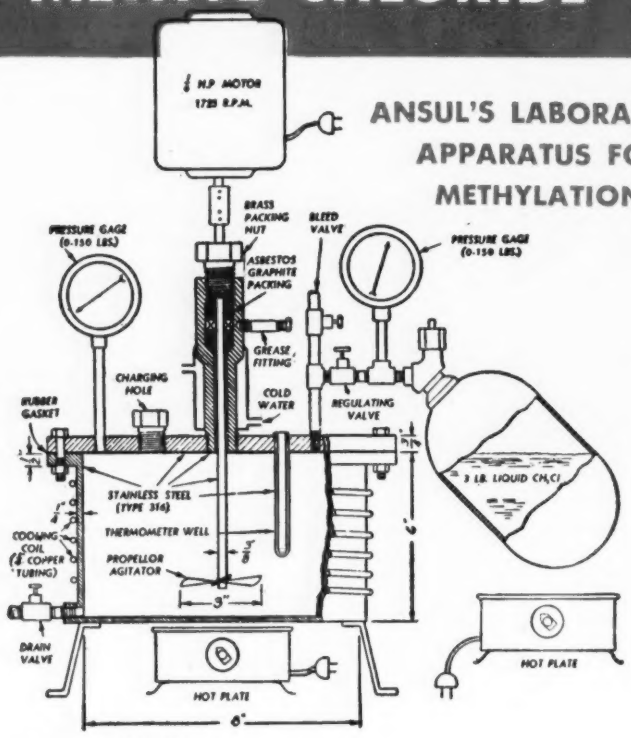
IT'S
Easy to Methylate
with ANSUL METHYL CHLORIDE



Advantages of CH_3Cl:

1—The rate of methylation is high at moderate (30-60 lb. per sq. in. gage) pressure and temperature. (50-100° C.)
2—More stable than other common methylating agents.
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PHYSICAL PROPERTIES

Chemical formula	CH_3Cl
Molecular weight	50.491
Color (gas or liquid)	Colorless
Odor	Ethereal, non-irritating
Melting point	−144° F. (−97.6° C.)
Boiling point	−10.65° F. (−23.7° C.)
Critical Temperature	289.6° F. (143.1° C.)
Critical pressure	969.2 lbs. per sq. in. abs.
Solubility	Methyl chloride in water—3 to 4 volumes methyl chloride vapor in 1 volume of water at ordinary temperatures and atmospheric pressure—methyl chloride in alcohol—readily soluble.
Specific gravity of liquid	.909

*REG. U. S. PAT. OFF.

Send for Bulletin No. 970, "Methylation with Methyl Chloride," and for "Liquid Methyl Chloride," a treatise on the properties and general handling of Ansul CH_3Cl.

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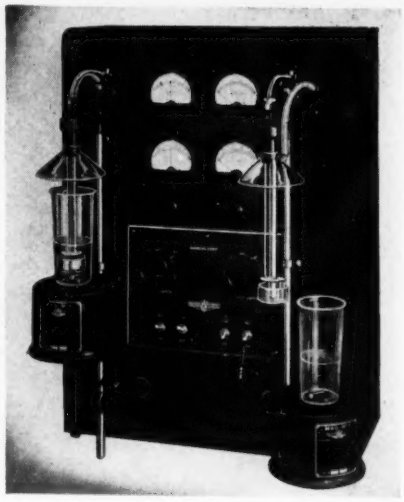
lates power flow into electrically heated devices according to temperature variations. It may reach and maintain any desired temperature within the range of 0-500° C. with a rated sensitvity of ± 0.25° C.

• The Mercalyzer of the Precision Scientific Co., 3737 W. Cortland St., Chicago, Ill., is used for the rapid electrolytic removal of heavy metals from

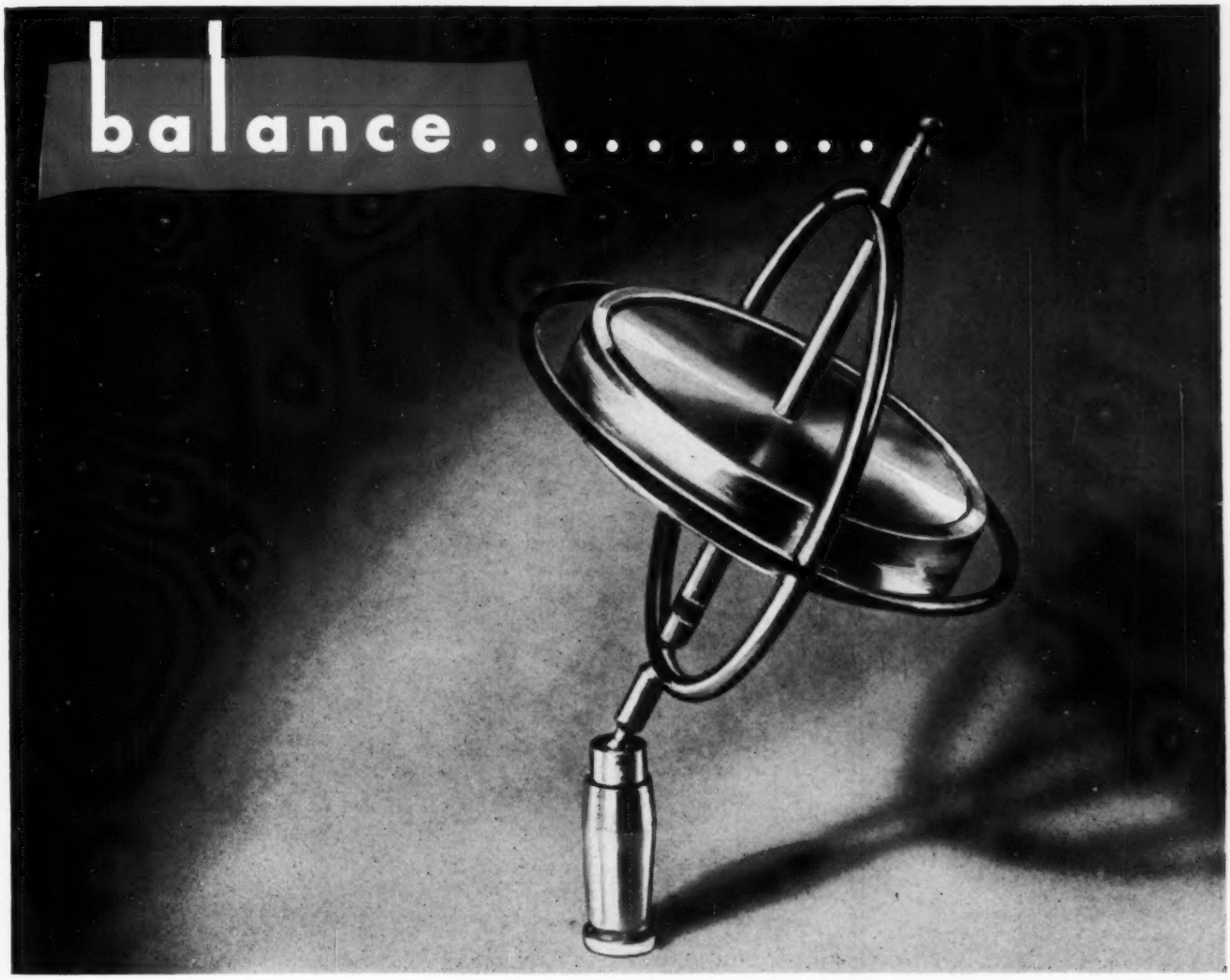


aqueous solutions of reactive metals. The range of applied potential, 0 to 10 volts, as well as the range of direct current, 0 to 10 amperes, permits the fast removal of large quantities of reactive metals. In addition, the use of magnetic stirring hastens the amalgamation of the reactive metals at the mercury surface. Two determinations can be made independently and simultaneously—either two amalgamations, two electro-depositions, or one amalgamation and one electro-deposition. The unit was developed in cooperation with the Shell Development Company.

• A new approach to the problem of controlling odors of manufactured products is provided by the Maskol odor control set of Cargille Scientific Co., 118 Liberty St., New York 6, N. Y. The set contains 1-oz. quantities of twelve different odor masking agents that are now used successfully in numerous industries to increase the marketability of products having unattractive odors.

• The "Loctite" laboratory filter of the Desert Sun Dry Fruit Co., 225 Clay St., San Francisco, Cal., is a stainless steel unit on which the filter paper, filter pads, or filter cloths are locked in place around the edges to prevent leaks or slippage. Filter aids, activated clays, or carbons can be used and the filter cake cannot be broken by suddenly releasing the vacuum.

A pot-type vacuum filter also manufactured can be made to 30" or more in diameter, with compartments which are capable of accomodating upwards of 50 gallons.



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Market Research

SOURCES OF INFORMATION FOR INDUSTRIAL MARKET RESEARCH, WITH SPECIAL REFERENCE TO THE CHEMICAL PROCESS INDUSTRIES, edited by *R. M. Lawrence*. CHEMICAL INDUSTRIES; New York, 1948; 102 p., $2.50. Review by Ross M. Cunningham, immediate past president and director, American Marketing Association, and associate professor of marketing, Massachusetts Institute of Technology.

THIS group of articles should be very helpful to all who are concerned with the wide range of industrial markets, fully as much as to those whose primary interest is in chemical markets. In addition, there is much of value for the marketing research worker in the consumer goods field.

The articles describe comprehensively the various agencies of the United States Government which collect and publish information of value to marketing men. The past and present publications of these agencies are outlined as well as their plans for future activities, and selected check-lists of publications are included. In addition, there are papers on state directories and on Canadian statistics.

Other articles treat of analysis of data, of presentation of reports, of methods of chemical market research, of measuring markets through use of salesmen's trade reports, of trade journals and trade directories, and of library methods of classifying market research information.

A working knowledge of information sources is essential to successful marketing research. Much of the information collected and published by Government agencies could not be secured at all by private investigation or could be obtained only at prohibitive cost. Furthermore, it is often possible to secure special analyses at nominal cost from the issuing agency providing there is no disclosure of individual returns.

Businessmen, too often, have not been fully aware of the value of information from governmental sources and have failed to support necessary legislation and appropriations. If business is to secure the information it needs in order to operate most intelligently, it must make its wants known.

Marketing research is a recognized business function today in many concerns; twenty years ago it was a rarity. Management more and more is seeking facts on which to base decisions, and all evident points to continued growth in acceptance of marketing research. In fact, we have here an emerging professional group in the thousands of men and women engaged in this field. These articles should be valuable not only to this group, but also to teachers of marketing.

With the growth of marketing research, the literature has also grown, but not as fast as would be desirable. Mr. Lawrence and his associates have made a very real contribution to this literature.

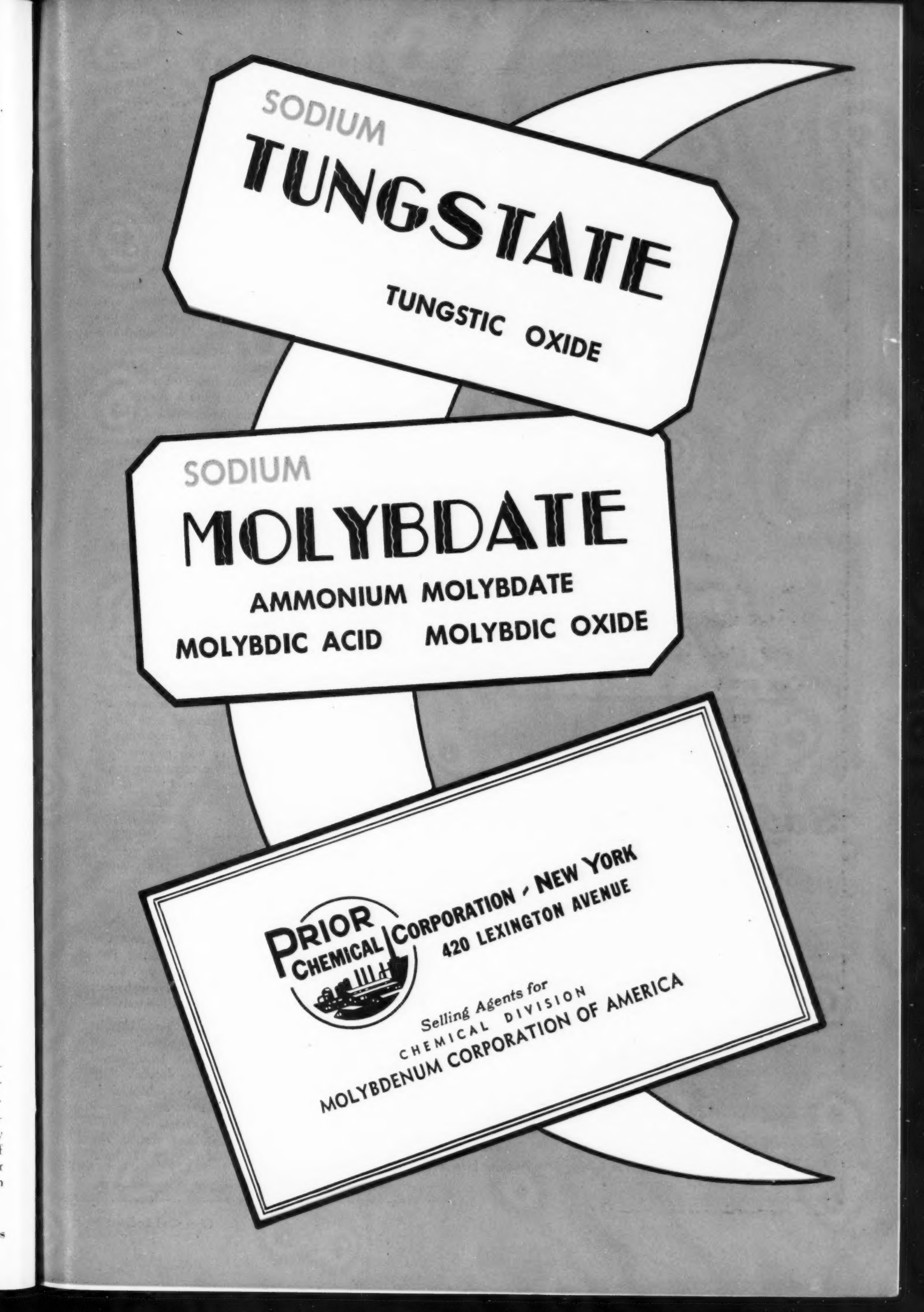
Fatty Acids

FATTY ACIDS AND THEIR DERIVATIVES by *A. W. Ralston*, John Wiley & Sons, Inc., New York and Chapman & Hall, Ltd., London, 1948. 986 pages, 5123 references. Price $10. Reviewed by H. G. Kirschenbauer, Colgate-Palmolive-Peet Co.

IN THIS volume the author gives an excellent presentation of the preparation of the fatty acids and of their important derivatives as well as of their physical and chemical properties. The important points and the major fundamental issues throughout the book are admirably emphasized. The historical background is skillfully described. In general the derivatives of the fatty acids have been given detailed consideration while a description of the naturally occurring fats, oils and waxes has been omitted intentionally. Some data, such as those pertaining to the acetylenic acids, the hydroxy acids, the keto acids, the cyclic acids, the dicarboxylic acids, the nitrogen containing derivatives of the fatty acids, the mercaptans, the sulfides, the anhydrides, the acid chlorides, and the ketones, have been exceptionally well described and with a completeness not found in any other fat and oil book.

The literature up to 1941 is copiously covered. However, the more recent references are not nearly as adequately recorded as the earlier bibliography. This is reflected in the general conclusions and in some chapters latest developments have not been accounted for. In spite of this shortcoming, the book has to be considered an outstanding contribution to the literature of the fats and fatty acid derivatives. The fact that the author's own extensive work has been collectively published in a coordinated form adds appreciably to the value of this volume.

The book is recommended to all institutions and individuals interested in fatty acid derivatives as a valuable source of references and as a supplement to other outstanding books recently published on the topic of fatty oils and fatty acids.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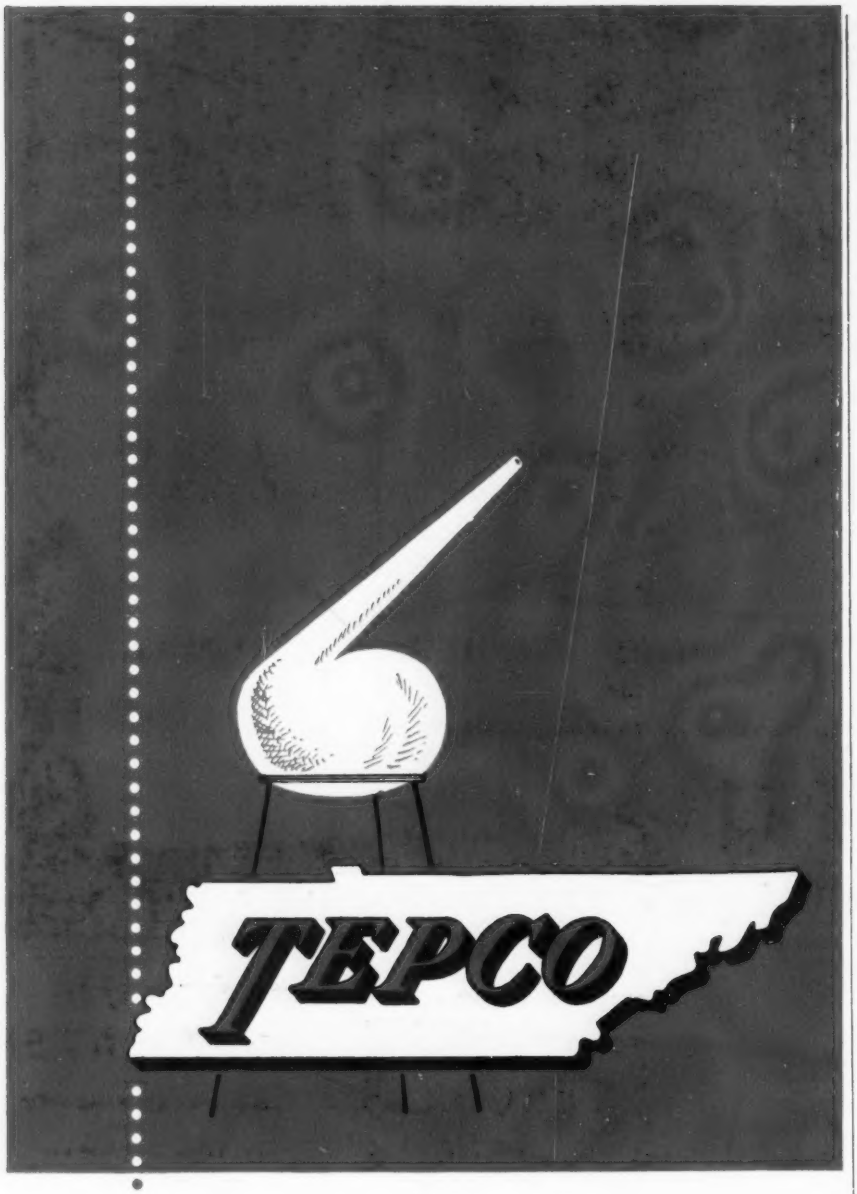

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High Polymers

MECHANICAL BEHAVIOR OF HIGH POLYMERS by *Turner Alfrey, Jr.* Interscience Publishers, Inc., New York, 1948, 581 pages, $9.50. Reviewed by E. R. Hanson, Director of Plastics Department, Foster D. Snell, Inc.

THIS book is Volume VI in the series of monographs on the chemistry, physics, and technology of high polymeric substances. Its text describes an attempt by the author to uncover the fundamental principles underlying the mechanical behavior of polymeric structures and to show how this behavior is correlated with the molecular structures involved. In this book polymer structures are classified and treated as amorphous linear, cross-linked and crystalline polymers and polymers admixed with components of low molecular weight. No attempt is made in the book to catalogue the mechanical properties of the whole myriad of known high polymers; in most cases no sufficiently fundamental studies have been carried out to make such a cataloguing worth while.

The author's attention is concentrated on the well known polymers such as rubber and the "synthetic rubbers" where the greatest part of the fundamental study has been made. The basis of this study is along the early part of the stress-strain curve while the point of actual rupture is ignored, although this strength is of the most practical importance.

In the last chapter of the book the author cites the numerous difficulties involved in measuring the ultimate strength of high polymers and discusses the various factors influencing such determinations. The lack of knowledge of ultimate strengths of high polymers emphasizes the need for concentrating future experiments on fundamental work of this nature.

Liberal quotations from original sources, appendices and an adequate bibliography increases the usefulness of the book as a reference work for other experimenters in the field.

Preparative Reactions

NEWER METHODS OF PREPARATIVE ORGANIC CHEMISTRY. Interscience Publishers, New York. 657 pp. $8.50. Reviewed by W. D. Niederhauser, Resinous Products and Chemicals Co.

THIS book brings the organic chemist fourteen articles, each by an expert, on preparative reactions that have gained fame within the last two decades.

The articles were first published in *Die Chemie* in 1940-1942, and were collected in book form in Germany in 1942. They have been translated, revised, and partly brought up to date by 17 American chemists.

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The authors have aimed at a general review of the reactions, and they include brief sections on experimental methods. Most of the 2,000 references fall in the period 1930-1947. The subjects covered are timely and interesting, and many of the reactions have achieved industrial importance. The excellent printing and free use of structural formulas make the book easy to read.

Several of the chapters cover subjects which have been reviewed in other publications, but in most cases this volume contains much material which had not been included in previous articles. The inclusion of more yield data would have increased the value of the book. Many of the patent references fail to mention inventor, company, and date.

The book is recommended as an excellent reference work and as a stimulus to further research.

Other Publications

CHEMICALS, information on market potentials and availability of products. This was formerly published as World Trade in Commodities. Superintendent of Documents, Government Printing Office, Washington 25, D. C. Yearly subscription, domestic, $1.50, foreign, $2.00.

ORGANIZATION AND METHOD FOR INVESTIGATING WASTES IN RELATION TO WATER POLLUTION. Manual Sheet W-1. Manufacturing Chemists Association of the United States, 608 Woodward Building, Washington 5, D. C. $.20.

1947 GUIDEBOOK AND DIRECTORY FOR THE METAL FINISHING INDUSTRIES. Metal Industry Publishing Co., 11 W. 42 St., New York 18, N. Y. 436 pp. Price $1.50.

BLUE BOOK OF SOUTHERN PROGRESS offers current statistical information including chemicals, power, transportation, labor, etc., on every state in the South. Manufacturers Record Publishing Co., Candler Building, Baltimore 3, Md. 200 pp. Price $2.00.

METAL PROCESS ENGINEERING by N. E. Woldman, a short treatise on various practical phases of metallurgical engineering. The material was accumulated during the development of a post-graduate course on the subject. Reinhold Publishing Corp., 330 W. 42nd St., New York City. 291 pp., $5.00.

THE WAY AHEAD, a new quarterly devoted to present day conditions in Holland. Stichting BOUW, 62, Koninginnergracht, The Hague, Holland. $3.00 per year in U. S.

TURF WEED CONTROL WITH 2,4-D by Dr. Fannie-Fern Davis, details of chemical formulations, equipment and application instruction. Hobart Publishing Co., Box 4127, Washington 15, D. C. 59 pp., $3.25.

Films

BIRTH OF A RAYON STAPLE FIBER PLANT, on the conversion of straw to viscose rayon. German, with English titles. PB-67563. Textile Research Institute, 10 E. 40th St., New York, N. Y.

WATER, WATER EVERYWHERE. Ion Exchange Products Dept., American Cyanamid Co., 30 Rockefeller Plaza, New York, N. Y.

SCIENCE IN RESIN DEVELOPMENT. Protective Coating Products Dept., American Cyanamid Co., 30 Rockefeller Plaza, New York, N. Y.

IT'S ALL IN THE FINISH. Textile Resin Dept., American Cyanamid Co., 30 Rockefeller Plaza, New York, N. Y.

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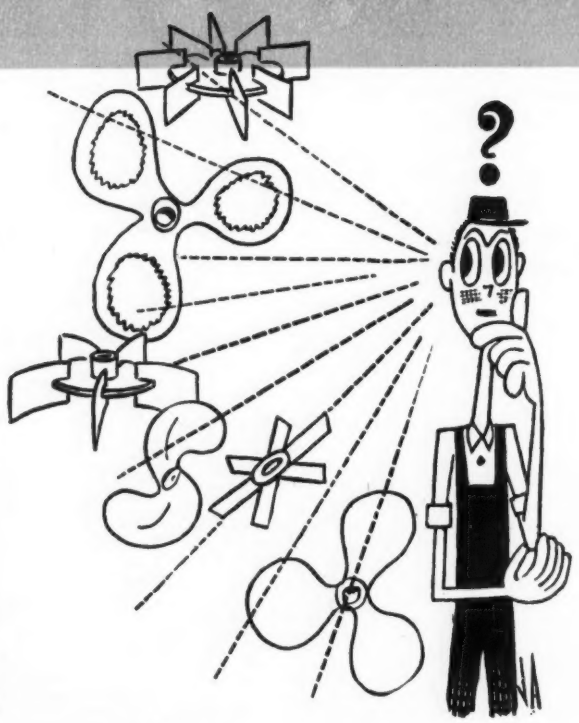

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SOLUTION: The following rules for comparison are suggested:

1. Select a quantitive criterion analagous to the actual operation in mind.
2. Compare performance of at least three sizes of each type of impeller you are going to test. This will show the optimum speed, size and position for each type.
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   Do not be surprised if your final results show identical performance with the optimum impellers from different types while a variation in performance *within* a family of impellers may be as much as 10:1.

THE REASON: Agitation compared on a power basis only comprises many hidden factors such as pumping capacity, velocity and stream pattern. These factors will vary to a greater extent between a 12″ and a 36″ impeller of a given type than between two 36″ impellers of different types.

A user undertaking to compare impeller performance thus has to duplicate the power tests and comparative data of not one manufacturer but that of all manufacturers of the impellers to be compared.

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NEWS OF THE MONTH

ACS Annual Meeting In Three Sessions

Fifteen thousand chemists and chemical engineers will participate in the 114th national meeting of the American Chemical Society, which will be held in three sessions in Washington, D. C.; St. Louis, Mo., and Portland, Ore., August 30 to September 17.

The Eastern Session, in Washington, will run from August 30 to September 3; the Midwest Session, in St. Louis, from September 6 to 10, and the Western Session, in Portland, from September 13 to 17.

The divided national meeting, first in the society's seventy-two-year history was arranged to enable the maximum number of the 57,000 members to attend, according to Charles A. Thomas, president of the society.

Recent developments in virtually every field of chemical science and technology will be reported in several hundred papers at a total of 120 technical sessions to be held in the three cities, under the sponsorship of eighteen professional divisions of the society.

Diamond Alkali Elects Crossley Treasurer

Arthur W. Crossley, elected treasurer of Diamond Alkali Co. He had been assistant general manager of the Potomac Electric Power Co., and during the war was a staff officer in the Chemical Warfare Service.

Japanese Technology Free to Allies

Full access to Japanese scientific and technical information and full rights to copy details of any commercial or industrial value will be allowed Government technical representatives beginning immediately and continuing through March 1949, under authority of the Far Eastern Commission.

The Japanese data thrown open for allied use under this order includes all such processes of Japanese origin and ownership developed prior to December 31, 1945.

U. S. Rubber Makes Zero GR-S Rubber

A new GR-S synthetic rubber with superior wearing qualities is now being made at the unprecedented low temperature of zero Fahrenheit at the Borger, Texas plant which the U. S. Rubber Co. operates for the Government. The new type shows promise of being event better than GR-S made at 41 degrees, developed during the last six months, which increases tire tread wear 30 per cent over the best natural rubber treads.

S. M. Cadwell, director of research and development for the company, has stated that for some months synthetic rubber has been produced at the low temperature of 41 degrees instead of the standard temperature of 122 degrees. This rubber, when combined with furnace black, provides a tire tread which exceeds by as much as 30 per cent the best natural rubber compounds.

OTS, Budget Cut, Will Continue

The Office of Technical Services will continue its services to business and industry in the next fiscal year, John C. Green, OTS director, has made clear. The operating plan calls for trimming but not abolishing services.

The acquisition, processing, and dissemination of hundreds of thousands of technical reports and documents received from domestic and foreign sources is the major OTS activity. It is anticipated that American business will have purchased over $1,000,000 worth of OTS reports by the end of this fiscal year.

Key reference to the OTS technology collection is the *Bibliography of Scientific and Industrial Reports*. Since January 1946 the *Bibliography* has appeared weekly. Each issue has contained about 1500 titles and abstracts of reports acquired.

The *Bibliography* now will be published monthly instead of weekly, and it will appear in less expensive format than formerly. Each monthly issue will list about 2,000 titles of OTS reports, but it will contain very few abstracts.

Under a "trust" fund arrangement OTS, as in the past, will print and sell copies of outstanding reports and documents for which there is considerable demand. Orders for photostat and microfilm copies of OTS reports, however, will be referred to the Library of Congress which has cooperatively agreed to take over the mechanics of this operation.

Last year OTS handled about 85,000 requests for information about industrial processes. With his reduced staff, Mr. Green does not anticipate that any such number of inquiries can be handled in the next fiscal year. Nevertheless, as many inquiries as possible will be answered. Special efforts will be made to prepare "form replies" for inquiries which recur frequently. No inquiries will be handled which require individual research.

The Pot Passes

Retiring president Wallace P. Cohoe of the Chemists Club passes the copper coffee pot, symbol of the club's highest office, to his recently-elected successor, Frank E. Barrows of Pennie, Edmonds, Morton & Barrows.

Plastics Industry Studies Labeling

Retailers, consumers and industry members of the plastics field have met to inaugurate the informative labeling program being sponsored by The Society of The Plastics Industry, Inc. This program will be prepared by representatives from the plastics industry in close cooperation with the Consumer Relations Committee of the National Retail Dry Goods Association and the National Consumer-Retailer Council.

In recent months new emphasis has been placed on this phase of merchandising by informatizing and the plastics industry, through the SPI, is one of the

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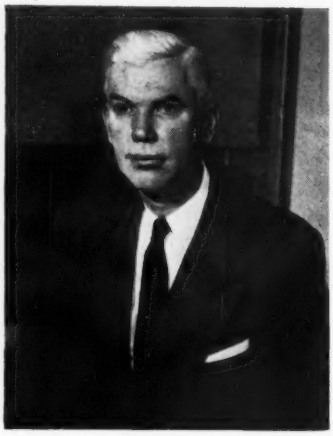
larger industry groups to actively inaugurate this type of program.

At the initial gathering the steps to be taken were arrived at by a composite of the points of view presented by all in attendance as expressed, for the industry, by the chairman, Elmer French, general sales manager of The Firestone Plastics Co. and Allan Brown, vice-president of Bakelite Corp.; for the SPI by Wm. T. Cruse, executive vice-president; for the retailer by Harold W. Brightman, president of Lit Bros. and chairman of Consumer Relations Committee of the NRDGA; for the consumer by Ruth W. Ayres, managing director of National Consumer-Retailer Council, Inc. Findings will be reported to the industry as a whole for such voluntary action as its members may see fit.

Rohm & Haas Appoints Landon



Robert C. Landon, appointed manager of industrial relations of the Rohm & Haas Co. and the Resinous Products & Chemical Co. He was previously with the Babcock and Wilcox Co. and the Carnegie-Illinois Steel Corp.

Form New Research Company

Everett M. Patterson, chief engineer and director of research for U. S. Time Corp. and Eversharp, Inc., and Anthony M. Moos, chief chemist for R. H. Macy & Co., Inc. and director of chemical research for Eversharp, Inc., have announced the formation of a new company to be known as Patterson, Moos & Co., Inc. Mr. Patterson is president, and Mr. Moos, vice-president of the organization.

This new firm will render a broad scientific consulting service and will assist clients in the management of research programs and in carrying on fundamental and applied research.

Its laboratories, occupying 8,000 square feet at 32-36 47th Ave., Long Island City, N. Y., are divided into four main divisions: chemical, metallurgical, mechanical, and electrical. In addition, there are a fully equipped experimental machine shop and facilities for chemical pilot plant production.

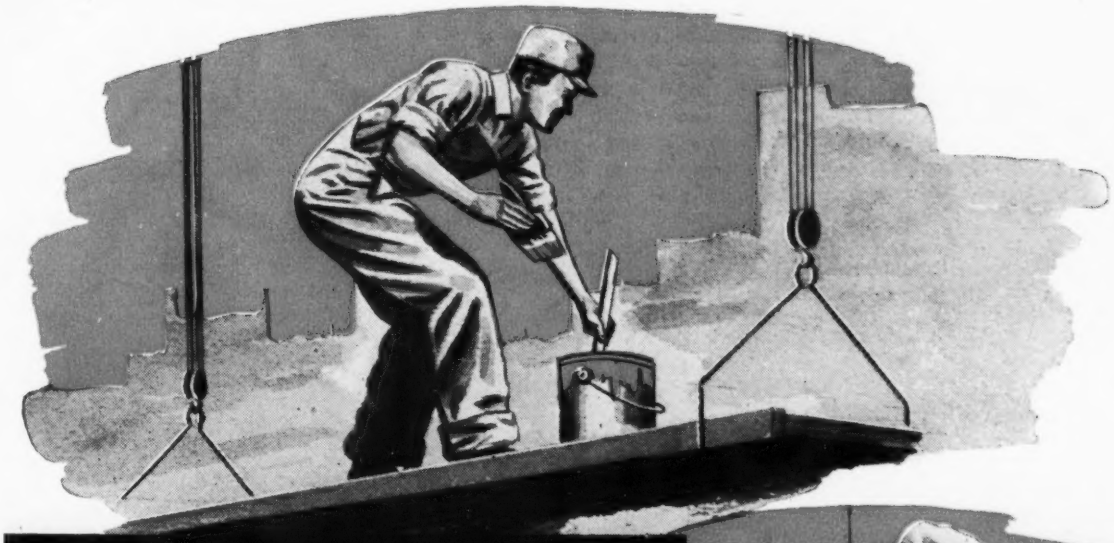
CALENDAR *of* EVENTS

AGRICULTURAL INSECTICIDE AND FUNGICIDE ASSOCIATION, annual meeting, Spring Lake, N. J., Sept. 7-9.
AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS, annual convention, Bon Air Hotel, Augusta, Ga., Oct. 21-23.
AMERICAN CHEMICAL SOCIETY, Eastern section, Washington, D. C., Aug. 30-Sept. 3; Midwestern section, St. Louis, Mo., Sept. 6-10; Western section, Portland, Oregon, Sept. 13-17.
AMERICAN CHEMICAL SOCIETY, National Exposition, Coliseum, Chicago, Oct. 12-16.
AMERICAN GAS ASSOCIATION, annual convention, Atlantic City, N. J., week of Oct. 4.
AMERICAN INSTITUTE OF CHEMICAL ENGINEERS, regional meeting, French Lick, Indiana, Sept. 15-17.
AMERICAN INSTITUTE OF MINING AND METALLURGICAL ENGINEERS, regional meeting, Hotel Cortez, El Paso, Texas, Oct. 24-27.
AMERICAN OIL CHEMISTS' SOCIETY, annual Fall meeting, Hotel Pennsylvania, N. Y. C., Nov. 15-17.
AMERICAN PETROLEUM INSTITUTE, Lubrication Committee, Hotel Traymore, Atlantic City, Sept. 16-18.
ASSOCIATION OF CONSULTING CHEMISTS AND CHEMICAL ENGINEERS, INC., annual meeting, Hotel Sheraton, N. Y. C., Oct. 26.
ASSOCIATION OF OFFICIAL AGRICULTURAL CHEMISTS, INC., annual meeting, Shoreham Hotel, Washington, D. C., Oct. 11-13.
COMPRESSED GAS MANUFACTURERS ASSOCIATION, INC., annual meeting, Canadian section, Murray Bay, Quebec, Sept. 9-11.
THE ELECTROCHEMICAL SOCIETY, semi-annual convention, Hotel Pennsylvania, N. Y. C., Oct. 13-16.
FOURTH INDUSTRIAL WASTE CONFERENCE, Purdue University, Sept. 21-22.
INSTRUMENT SOCIETY OF AMERICA, Third Instrument Conference and Exhibit, Philadelphia Convention Hall, Sept. 13-17.
NEW ENGLAND MATERIALS HANDLING EXPOSITION, Mechanics Building, Boston, Oct. 5-7.
NORTHEASTERN WOOD UTILIZATION COUNCIL, conference on "Chemistry and Utilization of Bock," Cambridge, Mass., Sept. 17.
PACKAGING MACHINERY MANUFACTURERS INSTITUTE, annual meeting, Hotel Commodore, N. Y. C., Oct. 11-12.
PORCELAIN ENAMEL INSTITUTE, 10th annual forum, University of Illinois, Urbana, Oct. 13-15.
SOCIETY OF THE PLASTICS INDUSTRY, Third National Plastics Exposition, Grand Central Palace, N. Y., Sept. 27-Oct. 1.
TECHNICAL ASSOCIATION OF THE PULP AND PAPER INDUSTRY, meeting sponsored by Fundamental Research Committee, Forest Products Laboratory and University of Wisconsin, Madison, Aug. 17-20.
TEXTILE RESEARCH INSTITUTE, INC., annual general meeting, Waldorf Astoria, N. Y. C., Nov. 18.

Facilities Scarce for German Research

A scarcity of scientific equipment and adequate library facilities provides the major obstacle in the work of scientists in Germany today, according to Karl Friedrich Monhoeffer, director of the Institute of Chemistry at the University of Berlin, who has been named the first Reilly Lecturer in Chemistry at the University of Notre Dame.

Commenting on the work of German scientists in the postwar era, Dr. Bonhoeffer explains that two-thirds of the scientific equipment available before World War II either was destroyed during the war or has disappeared and the



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available library sources are far below the standard required for scientific research.

Overcrowded schools and a lack of scientists are other problems faced in this work. Some German scientists are in England, some in the United States and others in Russia. The noted chemist believes that the American strictness in denazification proceedings has hindered the return to work of many scientists whereas in other sectors enticements such as extra food rations have been offered working scientists.

COMPANIES

Groundwork has already begun on the new multi-million dollar chemical plant for U. S. Idustrial Chemicals, Inc., on an 80-acre site adjacent to the Brownsville Texas Ship Channel. The project will include seven major buildings and 15 acres of tank farm. The tank farm will consists of 60 tanks with capacity varying from 20,000 to 500,000 gallons.

In addition to U. S. Industrial Chemicals, two other huge chemical plants will be constructed in the Brownsville area. The Stanolind Co. will refine chemicals derived by Carthage Hydrocol, Inc.

These Brownsville plants will make available large quantities of such products as normal propyl alcohol, normal amyl alcohol, propionic acid and butyric acid, and stimulate development of new solvents, plasticizers, pharmaceuticals, and plastics.

Berlage Names Smythe Vice-President

E. A. Smythe, for the past 1½ years export manager, named vice-president of J. Berlage Co., Inc.

The Glidden Co. has purchased 50 acres of land at Macon, Georgia, and plans to build three factories there at an investment of several million dollars. A plant to manufacture Durkee's Margarine will be immediately constructed at Macon, and as soon as building costs and general business conditions warrant, a second factory will be erected to produce salad dressings, shortening, and cooking oils. The third factory planned at Macon will be to manufacture Glidden's paints, varnishes and lacquers.

The General Wax Refining Co., New York City has appointed Allied Basic Chemicals Co., Ltd., Toronto, as its sales representatives for Ontario.

In an expansion of its facilities at Chattanooga, Tenn., the Tennessee Products and Chemical Corp. has placed a contract with Chemical Plants Division of Blaw-Knox Co. for engineering, procurement and installation of process equipment in the construction of a fine chemicals plant, expected to be in operation by the spring of 1949.

Lotte Chemical Co., Inc. has merged with Prescott Brothers, Inc. The name of the new consolidated company will be Lotte Chemical Co., Inc., and the office will remain, as formerly, at 109 Fifth Avenue, Paterson, New Jersey.

Michigan Chemical Corp., Saint Louis, Michigan, has transferred a portion of its Export Sales Department from the home office to 230 Park Avenue, New York City. Earl L. Reichard, export sales manager, is in charge of the distribution program of the company's pharmaceutical, industrial and insecticidal chemicals.

The Rust Engineering Co. of Pittsburgh, Pa., has been authorized by Socony-Vacuum Oil Co., Inc., to act as engineer-constructor for units to produce ethylene and aromatics by Socony's Thermofor pyrolytic cracking process.

Falk and Co., Pittsburgh, Pennsylvania has acquired the assets, good will and business of the Northwest Linseed Co. of Minneapolis. This step will give Falk control of linseed oil and meal from the flaxseed to the finished raw, refined and processed oils.

A new Du Pont laboratory, devoted to research and development work in the field of coated fabrics and allied products, has been opened at Newburgh, N. Y. on the property of the company's coated fabrics plant.

The Verona Chemical Co., Newark, New Jersey, has acquired the Aromatics Division of the General Drug Co. C. K. Wellenkamp, formerly in charge of the division and vice president of General Drug Co. is joining the Verona staff.

Chas. Pfizer & Co., Inc. has announced that the first carload shipments of citric acid have been made from its new 75-acre plant in Groton, Conn., marking the first production from this source.

Frontier Chemical Co., Midland, Texas, is increasing the current expansion program at its Denver City Plant to produce 25,000 tons of 20° Bé. muriatic acid

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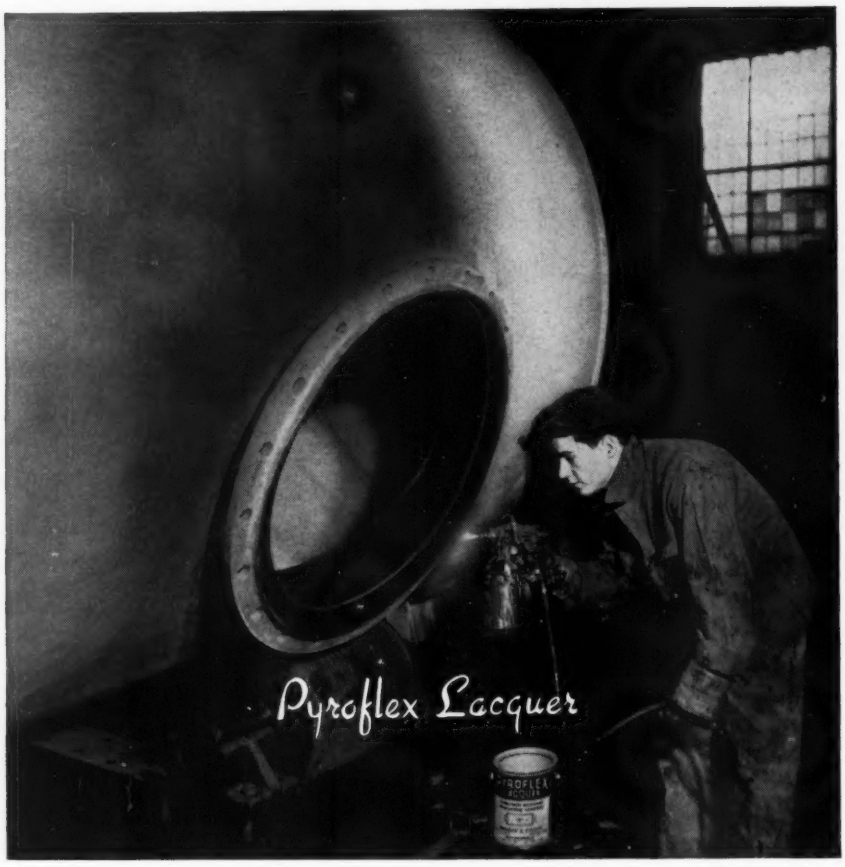

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and 7,500 tons of caustic soda annually. Facilities for the manufacture of solid and flake caustic soda are included. The project involves an expenditure of approximately $400,000, and will more than double the original production of these products. Completion of the entire program is scheduled for the end of this year.

Ansul Appoints Rinelli Director of New Dept.

William R. Rinelli, appointed director of Ansul Chemical Co.'s new customer relations department. He has been manager of the development division.

PERSONNEL

Company Officers

• PRIOR CHEMICAL CORP. has appointed Caspar Kaffke as assistant vice-president to act as technical adviser in research and development work. He became associated with the Prior interests in March 1947.

• R. E. Gray, general sales manager, has been named divisional vice president of The Centaur-Caldwell Division of STERLING DRUG INC.

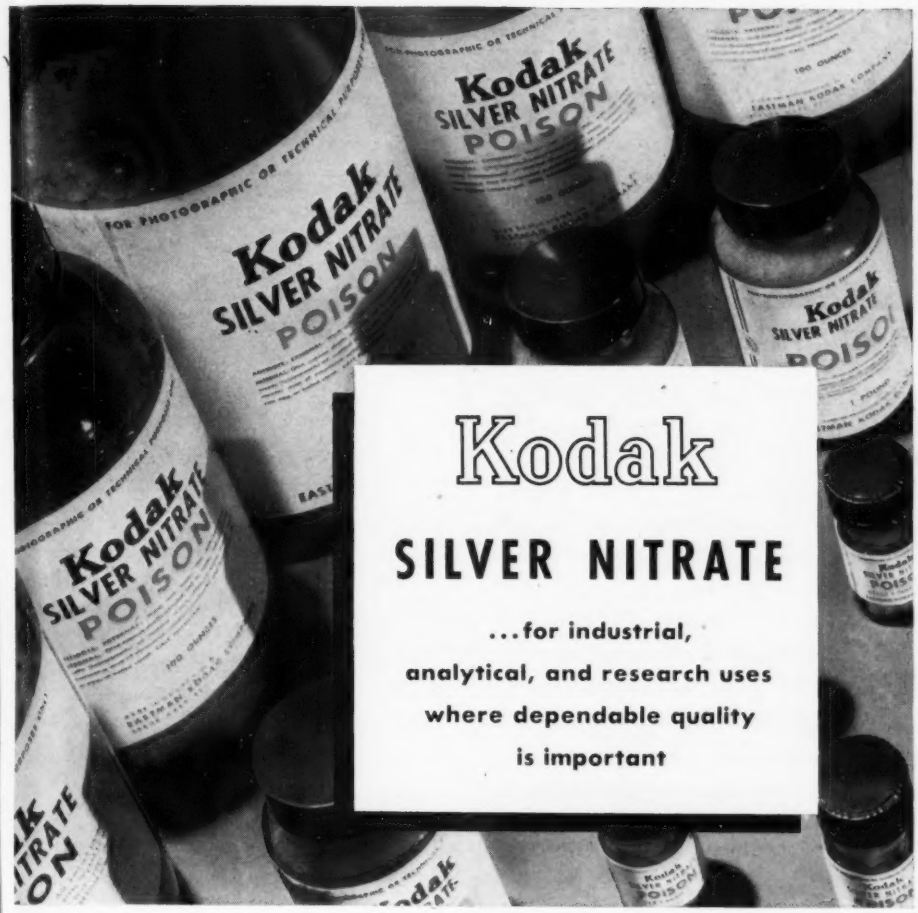
• P. Val Kolb has been elected vice president of GENERAL DRUG CO.

• J. Carl Bode, formerly operating manager, has been elected president of NATIONAL CARBIDE CORP. Mr. Bode succeeds L. A. Hull who becomes chairman of the board of directors.

Production

• R. A. Bondurant, Jr. has been appointed general manager of MICHIGAN CHEMICAL CORP. He succeeds John L. Giles who resigned January 1st. Mr. Bondurant joined the company in 1943 as assistant production manager.

• Edward J. Nolan has been named Rahway plant manager by MERCK & CO., INC., manufacturing chemists. Formerly manager of manufacturing in Rahway, Dr. Nolan came to Merck in 1936.



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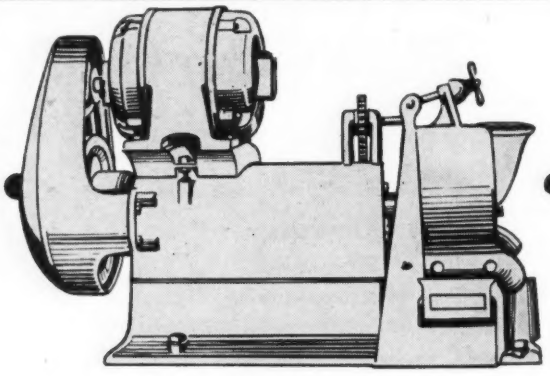

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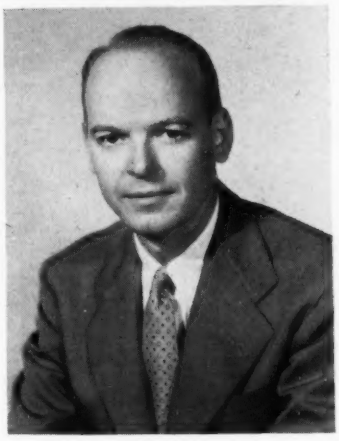

George B. Koch, named advertising and sales promotion manager of B. F. Goodrich Chemical Co., Cleveland, Ohio. He has handled publicity since joining the company in early 1946.

Sales

• BAKELITE CORP., a unit of UNION CARBIDE AND CARBON CORP., has appointed R. J. Southwell sales manager of CANADIAN RESINS AND CHEMICALS LIMITED. He has been technical representative for Bakelite since 1943.

• GIVAUDAN-DELAWANNA, INC., New York, manufacturers of aromatic chemicals and perfume raw materials, is enlarging its sales management staff. J. H. R. Stephenson will assume the duties of eastern sales manager, and R. M. Stevenson has been appointed Mid-Western sales manager. The appointments are effective as of October 1.

• Roger W. Jackson has been named district sales manager of the GENERAL ELECTRIC Co. Chemical Department's East Central District with headquarters in Cleveland. He takes his new post after more than three years as district representative at the Pittsburgh office.

• The Dow CHEMICAL Co.'s Magnesium Division has recently extended its system of individual sales managers by appointing J. C. H. Stearns manager of ingot sales, G. W. DeKuiper manager of wrought product sales, and T. H. Caldwell, Jr., manager of die castings sales.

Research

• William A. LaLande, Jr., for the last two and a half years director of the Whitemarsh Research Laboratories of PENNSYLVANIA SALT MANUFACTURING Co., has been appointed director of research and development. In his new post Dr. LaLande will continue to exercise control of the Whitemarsh Research Laboratories.

• R. F. Faull has been appointed to the newly-created position of manager of the La Habra, California, oil field research laboratory of CALIFORNIA RESEARCH

CORP., a Standard of California subsidiary. He will be responsible directly to Earl G. Gaylord, vice president in charge of oil field research for California Research Corporation.

CANADA

New Plants, Bond Issue Feature Expansions

Meredith, Simmons & Co., Ltd., and E. F. Houghton & Co., Ltd., affiliates of National Adhesives division of National Starch Products, Inc., New York, and E. F. Houghton & Co. of Philadelphia, respectively, have recently completed construction of new plants, while Columbia Cellulose Co., Ltd., wholly-owned subsidiary of Celanese Corp. of America, has announced an offering of $20 million of mortgage bonds within Canada for a new pulp plant. Rounding out this pattern of recent expansion activity is the commencement of construction of a Toronto branch plant and office of Eaton Chemical and Dyestuff Co., Detroit, Mich., to replace premises now leased in that city.

The new Meredith, Simmons installation will replace the original unit that has operated in Montreal for many years. Together with the recently remodeled factory at Toronto, it will produce a complete line of liquid and dry glues and adhesives, as well as specialty products for the paper and textile industries.

Houghton's new plant, located on 2½ acres of ground in northwest Toronto, will specialize in the manufacture of metal working products such as carburizers, quenching oils, cutting oils, heat treating salts and drawing compounds. Textile processing oils for wool, cotton and synthetic yarns, and surface active agents also will be manufactured, as well as industrial lubricants and mechanical leathers.

At the time of the Columbia Cellulose issue, it was stated that Celanese Corp. of America is subscribing for $12.5 million of capital stock in Columbia, of which $5 million will be paid-in at the time of the bond issue.

The proceeds from the sale of the bonds, together with a part of the other funds, will be used for building a pulp plant for the production of high alpha cellulose on Watson Island, near Prince Rupert, B. C. This cellulose is a basic raw material in the manufacture of cellulose acetate yarns and plastics, in which fields Celanese has a rapidly expanding business. The site is serviced by transcontinental railroad and highway and also has facilities for ocean-going steamships.

Upon completion of the British Columbia pulp plant, the parent organization will be in a strategic position insofar as raw materials are concerned as it now is producing at Bishop, Texas, the basic chemicals needed in its textile and plastics operations.

Chemicals Added to Restricted Imports List

Canada has added the following chemicals to the list of imports restricted by its Emergency Exchange Conservation Act: acetone, amyl acetate, ethylene glycol, dioctyl phthalate, styrene monomer, polystyrene molding powder, synthetic resin soft sheets, polyvinyl chloride compounds and co-polymers, zinc oxide, paraffin, chlorine, trisodium phosphate, tetrasodium pyrophosphate, and sodium tripolyphosphate.

This is the first time chemicals have appeared on the restricted list, and it means that the materials mentioned can no longer be imported into Canada except where the buyer possesses a specific Government permit to do so. Permits are granted only if the material cannot be obtained from Canadian sources or if the end use is considered essential to the national economy. All of the above chemicals are or soon will be obtainable in Canada.

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CHEMICAL SPECIALTIES

A department devoted to news of the chemical specialties field. Descriptions of new specialty products will be found in the New Products & Processes department.

Miller Bill Bolsters FDA Authority

The Miller Bill granting to the Federal Security Administrator jurisdiction over foods, drugs and cosmetics shipped in interstate commerce and coming to rest within a state, has become a law. The Act is intended to offset recent Circuit Court appeal decisions denying authority to the Federal Security Administrator over foods, drugs and cosmetics shipped in interstate commerce that have come to rest within a state for a long period of time.

The Food and Drug Administration felt that should it lose jurisdiction over such products held in original packages which became adulterated after they had come to rest in the hands of the purchaser within any given state, it would result in weakening the administration of the Food, Drug and Cosmetic Act of 1938 as amended, and would throw the burden of suppressing adulteration largely on state officials.

Babbitt Buys Glim

General Aniline & Film Corp. has sold to B. T. Babbitt, Inc. the liquid detergent, Glim, which General Aniline has marketed in limited areas of the United States since 1946. The transaction carries with it the Glim trade-mark. Terms of the sale were not announced.

The sale to Babbitt, manufacturers and distributors of cleansers, was made under a long-term contract which provides for the continued manufacture of Glim by General Aniline with Babbitt handling marketing, distribution and promotion.

Seersucker Rendered Wrinkle-Resistant

Joseph Bancroft & Sons Co. has developed a new process, employing Monsanto Chemical Co.'s Resloom to make seersucker wrinkle-resistant. The Resloom formula, a melamine formaldehyde resin, has been used over a fast-growing range of cotton fabrics, but previously its application to seersucker, most troublesome of fabrics from wrinkling standpoint, has not been successful. Goods carrying the new finish, called "Staznu," already are in production.

Monsanto has reported that a test of Bancroft seersucker showed it had wrinkle recovery of 136 degrees, which is comparable to that of good worsteds. It was pointed out that natural lustre and texture porosity of cloth is not affected, nor is the finish removed by repeated washings or dry cleaning.

Seymour Joins Johnson And Johnson

Raymond B. Seymour, appointed director of the special products research division of Johnson and Johnson. He recently resigned as director of the Industrial Research Institute of the University of Chattanooga.

New Miticide In Pilot Plant Stage

Production of a new miticide which is highly effective against the red mite is in the pilot stage at Battelle Institute, Columbus, Ohio, and sufficient quantities for extensive orchard tests can be produced. The research is sponsored by the Sherwin-Williams Co., developers of the miticide and owner of the patent rights to it.

The active agent in a formulation which Sherwin-Williams is marketing as Dimite is di(*p*-chlorophenyl) methyl carbinol, referred to as DMC. In laboratory and orchard tests, this chemical has shown a high contact and residual effectiveness against the red mite, and it is believed that it will offer a solution to the orchard mite problem resulting from the widespread use of DDT.

Unlike DDT, DMC does not kill the ladybird beetle and certain other predatory insects which normally control mite populations. For orchard use, formulations containing both DDT and DMC are a possibility.

Powell Celebrates 25th Anniversary

John Powell & Co., Inc., New York City, manufacturers of basic materials for the insecticide and allied industries, celebrated its 25th anniversary recently. At a party marking the event, the history of the company was traced from its beginning as an importer and dealer in crude drugs and botanicals to its present position as a world-wide organization of importance in the insecticide industry.

One of the first companies to specialize in pyrethrum insecticides, the Powell company still is one of the largest figures in this branch of the industry. Following the trend in insecticides, the company expanded into the rotenone field, then into other botanicals and finally into the synthetic organic chemicals which make up so many of the newer insecticide products.

2,4-D Dusting by Airplane Banned

Dusting of the weed-killer, 2,4-D, by airplanes has been banned by the Civil Aeronautics Administration. This action was recommended by the Department of Agriculture after many complaints of damage to crops had aroused cries in Congress. Among the crops that have been injured are cotton and other broadleaf plants.

Experiments are now being conducted by the Department of Agriculture to determine the drift of 2,4-D sprays at various altitudes and wind velocities and directions.

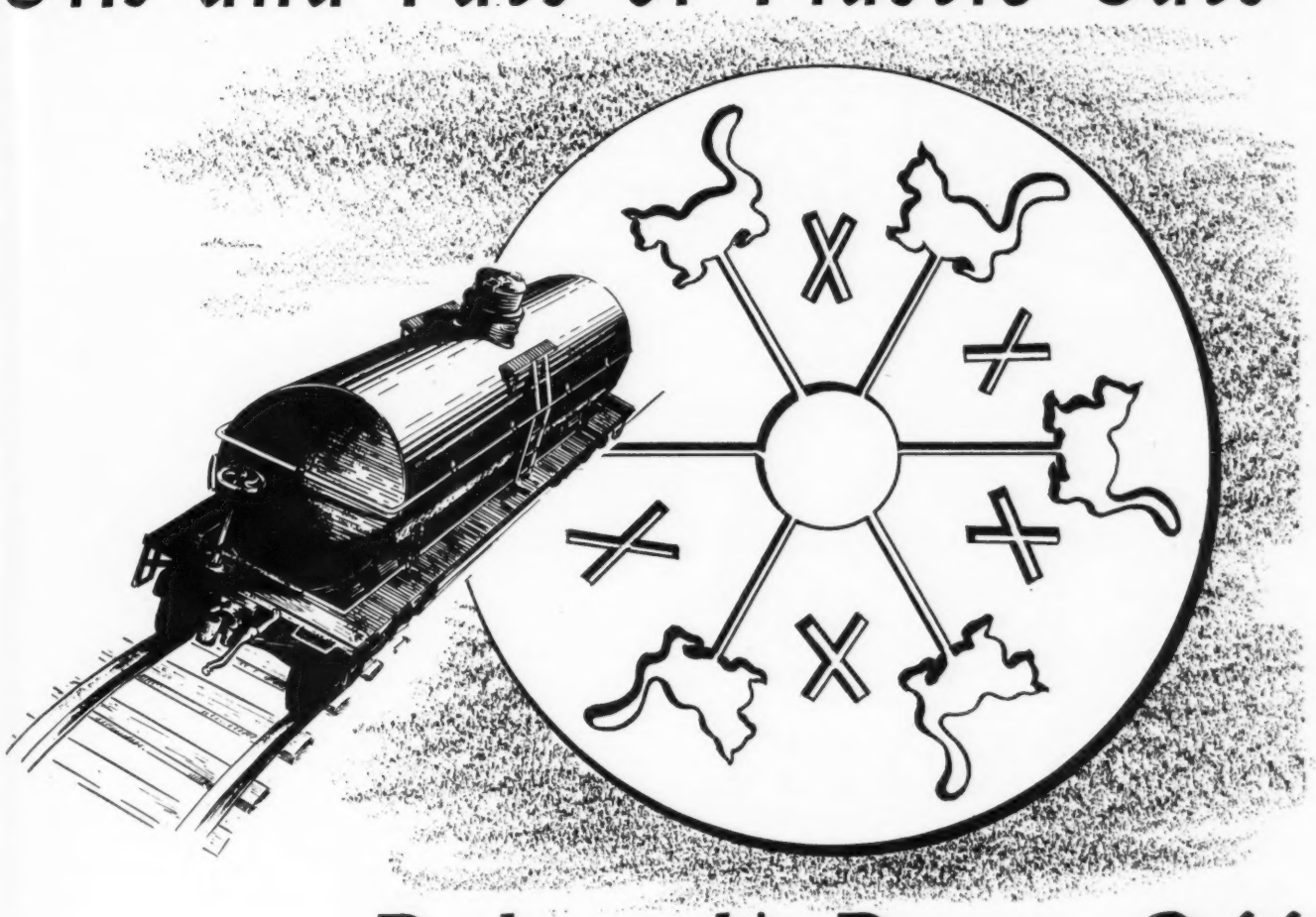
Du Pont Colloidal Silica In Full-Scale Production

The Du Pont Co.'s "Ludox" colloidal silica—a new product used by the textile, rubber, wax, and other industries—is now being produced in full-scale commercial quantities. A new unit for its manufacture has just been completed at the East Chicago, Indiana, Works of the Grasselli Chemicals Department and deliveries can now be made in any desired quantities.

When first announced by Du Pont in October, 1947, "Ludox" was available only on a small scale in 18% silica concentrations. Additional research and development work has led to production of stable solutions with a concentration of 30%, believed to be the highest concentration of stable silica in dispersion available commercially. This higher concentration permits substantial reduction in shipping costs and simplifies storage problems, and may broaden the field of application of the material.

"Ludox" already is being used in a variety of fields. It is effective in weave-setting treatments for rayon fabrics and

Oils and Fats or Plastic Cats



Polycel* Pays Off

Why not follow the industrial leaders and investigate Polycel? It has found application in a multitude of industries, and each day finds *new* uses.

In the oil—and fats—processing industries (and in all other fields where *filtration* is a major item) Polycel can serve as a filter aid.

Adaptable Polycel is used in filtration in three methods: (1) as a precoat, (2) direct mix. Polycel's scope in filtration is all-inclu-mix. Polycel's scope in filtration is all-exclusive. It is also used as the major component part of filter pad manufacture.

Polycel is equally endorsed by plastics manufacturers. Both a filler and a reinforcer, Polycel serves a double edged purpose... extending resins and making a stronger, more durable plastic.

Polycel is versatile—fitting into all sorts of processes. Industrial Chemical Sales' Polycel laboratories are at your disposal to analyze the possibilities of Polycel in your product.

* Polycel, purified wood cellulose fiber, is produced in bleached and unbleached form in four grades varying in fiber length: Fluff, 20, 40 and 80 mesh.

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Snow Top Precipitated Calcium Carbonate *Nuchar Activated Carbons* *Ligro Crude Tall Oil* *Indusoil Distilled Tall Oil*
Tallene Tall Oil Pitch *Tallex Abietic Acid* *Sulfate Wood Turpentine* *Alpha Pinene* *Beta Pinene* *Indulin (Lignin)*

in other textile applications. In rayon it increases friction between the fibers, thereby improving fabric "stability." It also strengthens yarn. In addition, it is finding applications in modifying many types of aqueous solutions and emulsions where it increases bond and film strength, and water resistance of adhesives, sizes or coatings. It also reduces objectionable stickiness or tackiness. Incorporated in aqueous wax dispersions, "Ludox" markedly increases the skid resistance of waxed floor surfaces. In modifying products made of natural or synthetic rubber latex, it strengthens elastic thread and the bonds of adhesives and cements of various types.

Lever Bros. Enters Margarine Field

Lever Brothers Co. has entered the margarine business with the outright purchase of the John F. Jelke Co. of Chicago, manufacturers of "Good Luck" margarine with annual sales of nearly $25 million. The Jelke Co. is the fourth major acquisition of Lever Brothers Co. in a program of expansion begun two years ago. During this same period, sales of Lever Brothers Co., the nation's second largest producer of soap, shortening and dentifrices, increased 51%.

Just a year ago, Lever bought Harriet Hubbard Ayer, Inc., America's oldest cosmetic and perfume firm, and in recent month bought the Luxor cosmetic business from Armour & Co. of Chicago. In May of this year, Lever became a factor in the beauty-preparation field with the acquisition of the Rayve line, and the Hedy home wave permanent product from William R. Warner Co.

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Reynolds Heads New Atlantic Office

Max H. Reynolds, placed in charge of the recently established Chicago sales office of the chemical products division of the Atlantic Refining Co. With the company 14 years, he has been in the research and development department.

U. S. Testing Co. to Study Ultrasonics

In entering the field of supersonic research, the United States Testing Co., Hoboken, N. J., has announced the completion of arrangements to take over in specific fields the research and development activities of the Crystal Research Laboratories of Hartford, Conn. This latter company developed the Ultra-Sonorator, the first laboratory apparatus for utilizing commercially the sound waves in ranges above those audible to the human ear. The deluge of inquiries for possible use of high frequency sound waves in various types of manufacturing necessitated separation of these potential developments from the actual production of the apparatus. The United States Testing Company has been selected to handle these inquiries and carry on research projects in this field.

The Ultra-Sonorator apparatus is now being installed at the Hoboken plant of the Testing Co., which together with selected scientific personnel, will form a complete operation for servicing this new field of investigation.

According to officials of the United States Testing Co., the studies will involve "ultrasonics" as differentiated from "supersonics." While the two terms have

been used interchangeably, men in this field reserve ultrasonics to describe frequencies of vibration or processing, while supersonics refers to speed of motion, namely speeds above the speed of sound.

Gallowhur Introduces Emulsifier Line

Gallowhur Chemical Corp. has introduced a complete line of emulsifiers (for chlordane and toxaphene) under the trade-mark name Skil. Also a new synthetic liquid detergent for sanitary use, named L-6, will be marketed simultaneously. It is stated that tests have shown these materials to have a high degree of efficiency in detergency action and for emulsification of chlordane and toxaphene.

Incombustible Finish Uses Fibers, Adhesive

The Bureau of Standards and Appeals of New York City recently approved as an incombustible decorative finish for interior surfaces a coating formed by application of an adhesive to the surface and then spraying specially prepared fibers onto the surface. A test panel of cement asbestos board coated with the finish was subjected to a forty minutes fire test.

The adhesive which is itself fire-resistant, has the following composition:

45%-55% alkyd vehicle
15%-17% inert pigments
18%-28% metallic carbonates
4%- 6% metallic borates
4%- 6% antimony oxide

These constituents are formed into a smooth coating by the usual paint industry grinding techniques.

The fibers, which are precision cut lengths of 5.5 denier, are produced by steeping sulfate pulp in a sodium hydroxide solution. When the excess alkali is pressed out, the pulp is shredded and aged. Treatment with carbon disulfide changes the alkali cellulose into cellulose xanthate, which is dissolved in silute sodium hydroxide to give the spinning solution. This amber colored viscous solution is filtered and deaerated, and then passed through a spinneret with holes ranging from 1/1000 to 5/1000 of an inch.

The filaments thus formed enter a bath, essentially water, to which has been added some dilute sulfuric acid, glucose and sodium sulfate. The bath in which the filaments are regenerated into cellulose and carbon disulfide, washes away the salts formed on neutralization. These coagulated cellulose filaments pass as a unit into a rotating Topham box. As the yarn is spun in the next step, it is washed, desulfurized, bleached, dried, and twisted. The filaments are then cut into 1½ mm. lengths for application to the adhesive binder by spray gun.

DDT Increases Alfalfa Seed Yields

Alfalfa seed yields were increased about 5 per cent in trials last summer by Oklahoma Agricultural Experiment Station entomologists when DDT dusts were applied to control infestation of the alfalfa tarnished plant bug.

Results of the tests show that both a 5 and 10 per cent DDT dust gave control when applied at a rate of 20 pounds per acre. The dust was applied just after the alfalfa started blooming following the second cutting for hay.

Figured on the basis of Oklahoma's present average seed yield of 1.7 bushels per acre, that would mean the new average could jump to over 2 bushels or about 120 pounds of seed.

Tests are to be continued this year to determine the effects of DDT on increased seed production under conditions of a heavier tarnished bug infestation.

Refinishing Product Prevents Blushing

Solflo, a new time-saving chemical product designed to bring out a high gloss from automobile lacquers with less rubbing than usual, is now being produced by the finishes division of the Du Pont Co. It is recommended that Solflo be added only to the last color coat or thinned "Duco" nitrocellulose lacquer for best results.

Made especially for the refinish trade, Solflo is designed to provide "blush" resistance, maximum gloss, and good flow. Blushing is the formation of a milky appearance in lacquer films which usually occurs when the humidity is high. It is claimed that when used as recommended, the new product will eliminate all blushing troubles except under unusual atmospheric conditions.

New Insecticides Halt Chinch Bug Migrations

Chinch bug migrations from ripened wheat and barley fields to corn and grain sorghums, can be controlled by chlorinated camphene and chlordane, reports R. G. Dahms, experiment station entomologist at Oklahoma A. and M. College.

One of the first protection measures a farmer should take if corn and sorghums are to be grown with small grains is to separate the fields as widely as possible. In the absence of such separation, the old standard is the creosote-dirt-ridge barrier method, but the newer chemicals give even better results.

Experiments set up by the entomologist at the A. and M. College show that chlorinated camphene 20 per cent used at 26 pounds per acre gave almost perfect control, and injury to the plants by this chemical was practically nil.

A second experiment using chlordane was set up. The results of this experiment showed that when it was used at 10 per cent and 28 pounds per acre it was second only to chlorinated camphene. There was slightly more damage to the plants by this chemical but not sufficient to restrict its use.

Dahms reports that 1 per cent gamma dust benzene hexachloride at 20 pounds to the acre gave excellent control of the bugs, but the possibility of plant injury from this chemical keeps it off the recommended list at this time.

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CHEMICAL MARKETS

Nitrogen Fertilizer Supply to Increase

The quantity of nitrogenous fertilizer expected to be available to U. S. farmers for the fertilizer year July 1, 1948, to June 30, 1949, will be about 10 per cent greater than the record quantity used during the season just ended, according to the U. S. Department of Agriculture. A total of 902,000 short tons of fertilizer nitrogen is expected to be available this year in all forms of material, compared with 817,000 tons last year.

This announcement followed action of the International Emergency Food Committee in approving recommended 1948-49 allocations of fertilizer nitrogen among the countries of the world. While there has been improvement in world supplies of fertilizer nitrogen as compared with 1947-48, the anticipated quantity for 1948-49 again will fall short of world demand.

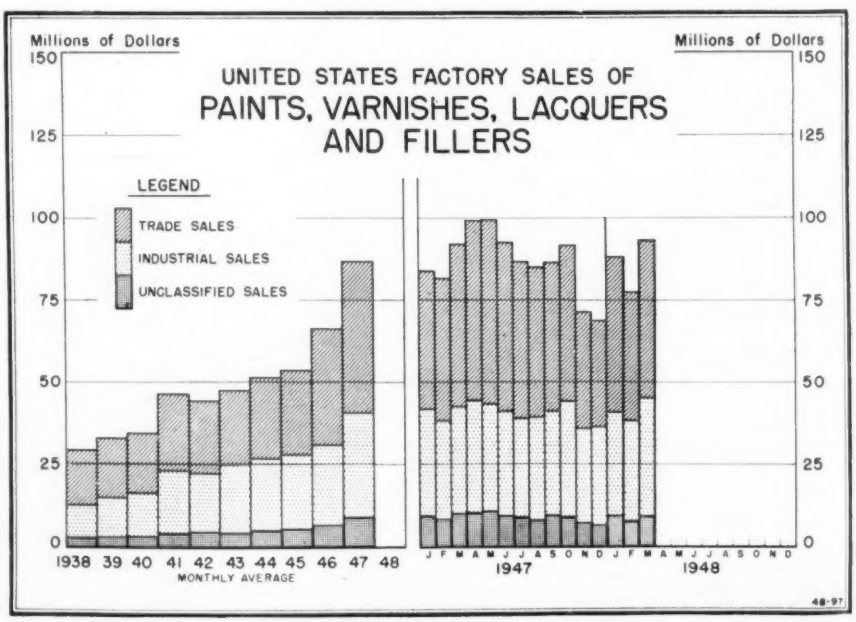
Three developments contribute about equally to the gain of 85,000 short tons of nitrogen for United States supply this year over 1947-48. First, will be an expected increase of about 26,500 tons in private domestic production and imports. Second, 28,000 tons will be available from the 10 per cent of anhydrous ammonia production at U. S. Government plants that must be turned over to commercial plants for conversion to fertilizer for domestic use. The other is the provision that 50 per cent of the 1948-49 U. S. export program for nitrogen fertilizer shall be made up of Army production. Since the export tonnage for the current year is the same as that of last year, 61,000 short tons of nitrogen fertilizer, the effect is to release 30,500 tons of commercially produced nitrogen for domestic use.

Chrome Shortages Laid To Maldistribution

In announcing that no further cuts in the already reduced export quotas for chromic acid and sodium bichromate are contemplated at present, the Department of Commerce stated that although chrome chemicals are in tight domestic supply, it was determined at a meeting of government officials and chrome chemicals trade repersentatives that exports do not constitute a major contributing factor to this condition.

The meeting was called primarily at the request of domestic consumers of chromic acid to determine what steps should be taken to counteract current shortages. Representatives of all phases of the chrome chemicals trade including industrial consumers presented statements of their views on the problem.

In the view of domestic consumers, the most serious condition exists in the case of the metal finishing industry, which normally accounts for approximately 85 per cent of U. S. chromic acid consumption. It was contended that many firms are being forced out of business because of inability to secure chromic acid, and that others are currently operating at less than 50 per cent of capacity. It was likewise indicated by consumers that producers' distributors are receiving reduced



amounts of chromic acid, and that metal finishers are unable to secure the commodity in former volume.

Producers, on the other hand, stated that their distributors' quotas have not been reduced. They asserted that new users of chromic acid have cut into supplies that would otherwise have been available. It was also pointed out that facilities in the process of construction will provide increased quantities of chromic acid, and that there has already been a substantial increase in production of sodium bichromate (the basic factor in the manufacture of chromic acid) from 158,000 tons in 1942 to a rate of 182,000 tons in 1948. Another key to the chrome chemicals supply situation, producers said, is the availability of South African chrome ore. Shortages of railroad cars in South Africa are reported to be affecting export movements to the United States.

It was the conclusion of both trade and Government representatives that the current export quotas for chrome chemicals are not unduly high, and do not seriously affect the domestic consumer. Over-ordering by many U. S. firms, for resale at high prices, was felt to be the cause of the tight supply situation. All committee members agreed that the problem was essentially one of domestic maldistribution.

New Estimate Augurs Ample Rubber Supply

The new estimate of world production of natural rubber for the calendar year 1948 as announced by Earl W. Glen,

Market Review

There were many bars from what is becoming a familiar refrain in the heavy chemicals picture: advances because of increased cost of labor, freight, fuel and raw materials, and shortages resulting from past or present strikes. Pennsalt's July 1 quotations on hydrate of alumina, chlorinated lime, anhydrous ferric chloride and hydrogen peroxide were up 2/5¢ to 1¢ a pound. $1.30 to $1.70 per cwt. is the new high price for commercial aluminum sulfate, with the iron-free correspondingly up to $2.50 to $2.90 per cwt. Although the Barberton strike settlement was welcome, its effect continued to be felt in the alkali situation, and the strike at Dow threatened to keep caustic soda tight. Demand had fallen off some, but the tone continued strong in light of this development and buying by different industries. Soda ash looked a little brighter with additional tonnage coming into the market. Seasonal demand for chlorine combined with industrial demand to preserve a strong tone.

While a good tonnage of copper sulfate was required by industry, the heavy spring rains further bolstered the demand for it — for agricultural use. Among agriculturals, the price trend followed the industrials. Du Pont's Uramon went to $89 per ton in bulk and $93 in bags, f.o.b. plant, freight allowed, an advance of $8, while Synthetic Nitrogen Products' Cal-Nitro (20.5% nitrogen) was up $5 at $38.50 per ton in bulk, and $32.50 in 100-lb. bags. Smaller producers were quoting ammonium sulfate at $45 a ton, f.o.b. plant, up $5 in a strong market. Ammonia solutions and standard grade B ammonia liquor went up to $117 per ton nitrogen and $76 per ton of NH_3 respectively. These were boosts of $10 and $11 per ton. In another upward adjustment a producer of commercial anhydrous ammonia raised his price $9 per ton to that of others, making the range in the market $68 to $71 per ton f.o.b. plants. Along with these advances were indications of a tight situation in all forms of nitrogen. American Cyanamid feared that it might have to cut deliveries of its Aero Cyanamid to 65% of that contracted for in the 1948-1949 season. It was also expected that the loss of potash because of U. S. Potash's strike at Carlsbad, N. M. would limit deliveries later in the fertilizer season. DDT was a step-child in this general scene of shortages as the market was reported long despite somewhat better demand.

Fine chemicals and drugs offered a contrast to other phases of the market. Formaldehyde exhibited a definite soft tone because of reduced demand and a falling off in export trade. Single drum lots of methanol also could be had for much lower prices as quotations of 42-45¢ per gallon were asked for the synthetic material. (A few months ago the price was 56-65¢.) A competitive situation developed in the penicillin market with discounts being offered to hospitals and the trade, and with a trimming of prices. A reduction of 2¢ per pound was made in the bulk price by a major producer to bring the price of procaine penicillin to 15¢ per 100,000 units and that of sodium and potassium to 14½¢ and 14¢ per 1000 units respectively, all in 100-million unit lots. Reductions of 20% were also made in the price of streptomycin.

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Lithium Aluminum Hydride is a unique, powerful and specific reducing agent which will instantly reduce carbonyl compounds, esters, acid chlorides and acid anhydrides to alcohols. Carbon to carbon double bonds are generally not affected.

Properties

Appearance: White to gray microcrystalline
Molecular Weight: 37.94
Solubility: In diethyl ether and tetrahydrofuran

NOTE THESE ADVANTAGES:

- Stable at room temperature in dry air; thermal decomposition occurs at temperatures above 125°C.
- Ether soluble
- Compared with other reducing agents (except hydrogen) has a favorable ratio of reducing capacity to mass
- Standard equipment may be used
- Reductions occur at room temperature
- Available commercially

ILLUSTRATIVE REACTION:

crotonaldehyde — crotyl alcohol

METAL HYDRIDES INC.

FACTORY AND SALES OFFICES, 12-24 CONGRESS ST., BEVERLY, MASS.

Chief, Rubber Division, Office of Domestic Commerce, is placed at from 1,450,000 long tons to 1,500,000 long tons. The previous accepted production estimate by the International Rubber Study Group had been 1,391,000 long tons. Hence, there is now recognized the possibility of increased production of natural rubber in the world in 1948 of from 59,000 long tons to 109,000 long tons depending upon social, political and economic developments in the rubber-producing areas.

GR-S (general purpose synthetic rubber) is currently being produced at a rate of about 34,000 long tons a month or 408,000 long tons a year. Butyl, neoprene and other special purpose synthetics are being produced at a rate that will provide an additional 100,000 long tons. It would appear that Canada may produce about 30,000 long tons of all types of synthetic rubbers in 1948. Therefore the total world supply of new rubber material for 1948 will be in the vicinity of two million long tons.

Foreign demand for natural and synthetic rubber is now expected to be around 825,000 long tons which leaves approximately 1,175,000 long tons of new rubber material available to the United States. This total, plus ample supplies of reclaimed rubber, should satisfy the programmed requirements of the strategic stockpile as well as the needs of the domestic rubber manufacturing industry, on the basis of synthetic rubber and reclaimed rubber being consumed at a high rate during the remainder of 1948.

Wood Preservative Consumption Up

Treatment with preservatives of forest products going into industrial use for railroads, telephone and telegraph lines, harbor installations and construction projects in the United States, as measured by the amount of wood treated, was 13 per cent higher last year than in 1946, the Forest Service in the U. S. Department of Agriculture reports.

The total material treated last year was the largest on record, except for that in 1939 when the previous record was achieved. In 1939, the amount of wood treated before being put to use was 362,009,047 cubic feet, as compared to 349,485,790 last year, and 304,060,648 in 1946. During the war the difficulty in getting chemicals, manpower shortages and other factors greatly cut down the amount of wood treated. Previous to the war, the amount of wood treated annually had been steadily increasing.

The chemicals used in the treating processes were mainly creosote, creosote petroleum, chromated zinc chloride and Wolman salts. A total of 279,874,328 gallons of liquid preservative, and 16,247,075 pounds of solids were used.

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Crosby Pale Wood Rosins are produced in modern aluminum and stainless steel equipment under rigid technical control to insure high quality, and are characterized by exceptional brilliance, cleanliness and uniformity. All grades X to H are produced. Highly recommended for use in Soaps, Paper Size, Ester Gums, Varnishes, Synthetic Resins and many other products.

TECHNICAL DATA

Grades	X, WW, WG, N, M, K, I, H.
Color (Lovibond)	12 yellow, 1.1 red to 40 yellow, 12.4 red
Melting Point (drop method)	175 to 182F
Acid Number	160 to 169
Saponification Number	165 to 174

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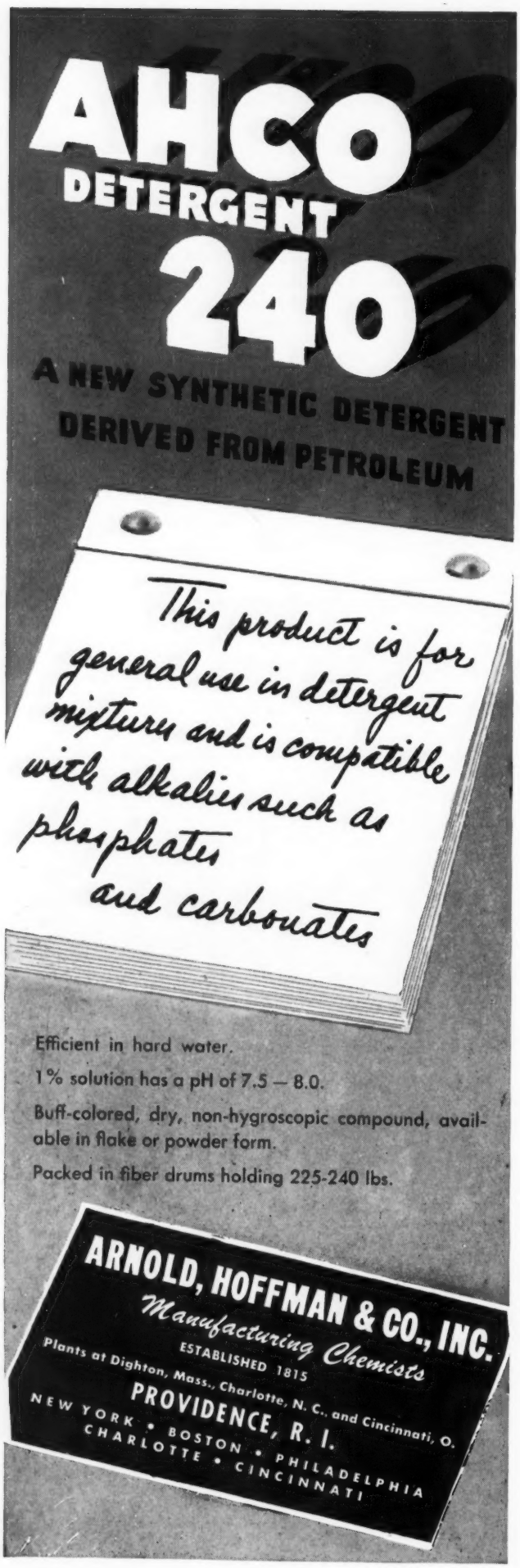
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Chemical prices quoted are of American manufacturers for spot New York, immediate shipment, unless otherwise specified. Products sold f.o.b. works are specified as such. Important chemicals are so designated.

Oils are quoted spot New York, ex-dock. Quotations f.o.b. mills, or for spot goods at the Pacific Coast are so designated.

Raw materials are quoted New York f.o.b., or ex-dock. Materials sold f.o.b. works or delivered are so designated.

The current range is not "bid and asked," but are prices from different sellers, based on varying grades or quantities or both.

Purchasing Power of the Dollar: 1926 Average—$1.00
July, 1946, $0.842 *July, 1947, $0.624*
July, 1948, $0.580

	Current		1948		1947	
	Low	High	Low	High	Low	High
Acetaldehyde, 99%, drs wks ..lb.	.11	.12	.11	.12	.11	.15
Acetic Anhydride, drs, c.l., frt. all. E ..lb.	.13	.14½	.13	.14½	.11½	.14½
Acetone, tks, delv ..lb.	.07	.09	.07	.09	.07	.09
ACIDS						
Acetic, 28% bbls ..100 lbs.	3.78	4.08	3.78	4.08	3.38	4.08
Glacial, synthetic C. P., drs, wks ..100 lbs.	13.50	14.00	13.50	14.00	13.50	14.00
Acetylsalicylic, Standard USP ..lb.	.45	.59	.45	.59	.45	.59
Benzoic, tech, bbls ..lb.	.43	.47	.43	.47	.43	.47
USP, bbls, 4,000 lbs. up ..lb.	....	.54	....	.54	....	.54
Boric tech, bbls. c-l, frt. split ..tons	....	124.00	....	124.00	....	124.00
Chlorosulfonic, drs, wks ..lb.	.03	.04½	.03	.04½	.03	.04½
Citric, USP, crys, gran, bbls ..lb. *b*	.22	.25	.22	.25	.20	.23
Cresylic 50%, 210-215° low boil 50%, drs, wks, frt, equal ..gal.	1.26	1.61	1.26	1.61	1.01	1.26
Formic, 85%-90% cbys ..lb.	.12	.14½	.12	.14½	.10	.14½
Hydrofluoric, 30% steel, drs ..lbs.	.08	.09	.08	.09	.08	.09
Lactic, 22%, bbls, c.l., wks ..100 lbs.	....	5.80	....	5.80	....	4.40
44%, light, bbls, wks ..lb.	.0815	.0895	.0815	.0895	.073	.0855
Maleic, Anhydride, drs ..lb.	.25	.30	.25	.30	.25	.26
Muriatic 18° cbys ..100 lbs.	1.50	2.90	1.50	2.90	1.50	2.90
20° cbys, c-l, wks ..100 lbs.	1.85	2.00	1.85	2.00	1.85	2.00
22° cbys, c-l, wks ..100 lbs.	2.35	2.50	2.35	2.50	2.35	2.50
Nitric, 36°, cbys, wks 100 lbs. *c*	5.00	6.30	5.00	6.30	5.00	6.30
38°, c-l, cbys, wks 100 lbs. *c*	2.35	5.50	2.35	5.50	....	5.50
40°, c-l, cbys, wks 100 lbs. *c*	6.00	6.50	6.00	6.50	....	6.50
42°, c-l, cbys, wks 100 lbs. *c*	6.50	7.00	6.50	7.00	....	7.00
Oxalic, bbls, wks ..lb.	.13	.14	.13	.14	.11¾	.14
Phosphoric, 100 lb. cbys, USP ..lb.	.10½	.13	.10½	.13	.10½	.13
Salicylic tech, bbls ..lb.	.31	.38	.31	.38	.26	.42
Sulfuric, 60°, tks, wks ..ton	12.25	13.50	12.25	13.50	....	13.50
66°, tks, wks ..ton	15.00	17.50	15.00	17.50	....	17.50
Fuming 20%, tks, wks ..ton	18.00	20.50	18.00	20.50	....	20.50
Tartaric, USP, bbls ..lb.	.41½	.50	.41½	.50	.49½	.55
Alcohol, Amyl (from Pentane) tks, delv ..lb.	.17	.25	.17	.25	....	.25
Butyl, normal, syn, tks ..lb.	....	.17	....	.17	....	.17
Denatured, CD, proprietary solvent ..gal. *d*	1.03½	1.08½	1.03½	1.08½	1.00½	1.03
Ethyl, 190 proof tks ..gal.	17.95	18.13	17.95	18.13	18.04	18.08
Isobutyl, ref'd, drs ..lb.	....	.13	....	.13	....	.13
Isopropyl ref'd, 91% drms ..gal.	.44	.50½	.44	.50½	.41	50½
Alum, ammonia, lump, bbls, wks ..100 lbs.	4.05	4.25	4.05	4.25	....	4.25
Aluminum, 98.99% ..100 lbs.	15.00	16.00	15.00	16.00	15.00	16.00
Chloride anhyd, l.c.l. wks ..lb.	....	.10¼	....	.10¼	....	.10¼
Hydrate, light, bgs ..lb.	....	.17	....	.17	....	.17
Sulfate, com'l. bgs, wks, c-l ..100 lbs.	1.15	1.30	1.15	1.30	1.15	1.30
Sulfate, iron-free, bgs, wks ..100 lbs.	1.95	2.50	1.95	2.50	1.75	2.50
Ammonia anhyd. cyl ..lb.	.16	....	.16	....	.14½	.20
Ammonia, anhyd, frt, tank cars, wks, frt, equalized ..ton	....	59.00	....	59.00	....	59.00
Ammonium Carbonate, USP lumps, drs ..lb.	.08¼	.19	.08¼	.19	.08¼	.19
Chloride, USP bbls, drms, kgs ..lb.	.13	.15	.13	.15	.13	.15
Nitrate, tech, bgs, wks ..lb.	.0213	.0225	.0213	.0225	.0218	.0225
Oxalate pure, grn, bbls ..lb.	.23	.29	.23	.29	.23	.29
Perchlorate, kgs ..lb.	.25	....	.25	....	.24	.25
Phosphate, dibasic tech, bgs ..lb.	.07	.07¾	.07	.07¾	.07	.07¾
Stearate, anhyd, drs ..lb.	....	.34	....	.34	....	.34
Sulfate, drs, bulk ..ton	30.00	40.00	30.00	40.00	30.00	38.00

USP $25 higgher: Prices are f.o.b. N. Y., Chicago, St. Louis, deliveries ½c higher than NYC prices, *a* Powdered boric acid $5 ton higher; *b* Powdered citric acid is ½c higher; *c* Yellow grades 25c per 100 lbs. less in each case; *d* Prices given are Eastern schedule.

Current Prices

Amyl Acetate Gums

	Current Low	Current High	1948 Low	1948 High	1947 Low	1947 High
Amyl Acetate (from pentane) tks, delv.....lb.	.21	.29	.21	.29	.21	.24
Aniline, Oil, dms.....lb.	.13	.15	.13	.15	.12	.14
Anthraquinone, 99.5%, bbls.lb.	.70	.80	.70	.80	....	.70
Antimony Oxide, bgs.....lb.	.26	.31	.26	.31	.21	.31
Arsenic, whl, bbls, powd....lb.	.06	.08	.06	.08	.05	.08
Barium Carbonate precip, wks, bgs.....ton	67.50	82.00	67.50	82.00	60.00	82.00
Chloride, tech, cryst, bgs, zone 1.....ton	85.00	95.00	85.00	95.00	73.00	95.00
Barytes, floated, paper bgs.ton	....	33.30	....	33.30	....	41.95
Bauxite, bulk mines.....ton	8.50	10.00	8.50	10.00	7.00	10.00
Benzaldehyde, tech, cbys, drs.....lb.	.45	.55	.45	.55	.45	.55
Benzene (Benzol), 90%, tks, frt all'd.....gal.	.19	.21	.19	.21	.19	.21
Benzyl Chloride, cbys.....lb.	.19	.28	.19	.28	.20	.28
Beta-Naphthol, tech, bbls, wks.....lb.	.23	.30	.23	.30	.21	.29
Bismuth metal, ton lots....lb.	....	2.00	....	2.00	....	2.00
Blanc Fixe, 66⅔ Pulp, bbls, wks.....ton	55.00	65.00	55.00	65.00	40.00	60.00
Bleaching Powder, wks.....100 lbs.	2.75	4.75	2.75	4.75	2.50	3.75
Borax, tech, c-l, bgs.....ton	48.50	56.00	48.50	56.00	45.00	56.00
Bordeaux Mixture, bgs.....lb.	.15	.23	.15	.23	.11	.23
Bromine, cases.....lb.	.21	.23	.21	.23	.21	.23
Butyl, acetate, norm, dms..lb.	.30½	.36½	.30½	.36½	.26	.33½
Cadmium Metal.....lb.	1.75	1.80	1.75	1.80	....	1.80
Calcium, Acetate, bgs..100 lbs.	3.00	4.00	3.00	4.00	3.00	4.00
Carbide, drs.....ton	50.00	140.00	50.00	140.00	50.00	90.00
Chloride, flake, bgs, c-l...ton	21.50	38.00	21.50	38.00	18.50	38.00
Solid, 73-75% drs, c-l....ton	20.00	37.50	20.00	37.50	18.00	37.50
Gluconate, USP, bbls....lb.	.58	.65	.58	.65	.57	.65
Phosphate tri, bbls, c-l...lb.	6.50	6.80	6.50	6.80	6.50	6.80
Camphor, USP, gra s, powd, bbls, 2,000-lb. lots.....lb.	.66	.78	.66	.78	.75	.82
Carbon Bisulfide, 55-gal. drs.....lb.	.05	.05¾	.05	.05¾	.05	.05¾
Dioxide, cyl.....lb.	.06	.08	.06	.08	.06	.08
Tetrachloride, Zone 1, 52½ gal. drs.....lb.	.06½	.07	.06½	.07	.06	.07
Casein, Acid Precip, bgs, 10,000 lbs. or more.....lb.	.30	.35	.30	.35	.26	.35
Chlorine, cyls, lcl, wks, contract.....lb.	.07	.15½	.07	.15½	. ¾	.10½
Liq, tk, wks, contract.....100 lbs.	....	2.25	....	2.25	....	2.30
Chloroform, tech, drs.....lb.	.20	.23	.20	.23	.20	.23
Coal tar, wks, crude, dms, c-l, wks.....dm.	....	10.60	....	10.60	....	10.60
Cobalt, Acetate, bbl.....lb.	....	.83¾	....	.83¾	....	.83¾
Oxide, black kgs.....lb.	1.275	1.80	1.275	1.80	....	1.30
Copper, metal.....100 lbs.	....	21.50	....	21.50	21.50	24.00
Carbonate, 52-54%, bbls..lb.	.24	.26	.24	.26	.19½	.26½
Sulfate, bgs, wks cryst. .....100 lbs.	7.60	8.00	7.60	8.00	7.10	8.60
Copperas, bulk, c-l, wks....ton	....	14.00	....	14.00	....	14.00
Cresol, USP, drs.....lb.	.14	.19¼	.14	.19¼	.13¾	.15¾
Dibutylamine, c-l, drs, wks..lb.	.52½	.76	.52½	.76	....	.76
Dibutylphthlate, drs.....lb.	.32	.38½	.32	.38½	.29	.38½
Diethylaniline, drs.....lb.	....	.69	....	.69	....	.48
Diethylene glycol, drs, wks..lb.	.14	.16½	.14	.16½	.14	.15
Dimethylaniline, drs, cl., lcl.....lb.	.21	.24¼	.21	.24¼	.20	.24¼
Dimethylphthalate, drs.....lb.	.23½	.27½	.23½	.27½	.20	.24¾
Dinitrobenzene, bbls.....lb.	.16	.21¾	.16	.21¾	....	.16
Dinitrochlorobenzene, dms..lb.	.14	.17	.14	.17	.14	.15½
Dinitrophenol, bbls.....lb.	....	.26¾	....	.26¾	....	.22
Dinitrotoluene, refd., drs...lb.	....	.18	....	.18	....	.18
Diphenyl, bbls, lcl, wks.....lb.	.15	.20	.15	.20	.15	.20
Diphenylamine, bbls.....lb.	....	.25	....	.25	....	.25
Diphenylguanidine, drs ....lb.	.35	.37	.35	.37	.35	.37
Ethyl Acetate syn. 85-90%, tks, frt. all'd.....lb.	.09½	.13½	.09½	.13½	.09½	.12
Chloride, USP, bbls.....lb.	.20	.22	.20	.22	.18	.22
Ethylene Dichloride, lcl, wks, E. Rockies, drs.....lb.	.08½	.09½	.08½	.09½	.08½	.09½
Glycol, dms, cl. .....lb.	....	.15	....	.15	....	.12
Fluorspar, No. 1, grd. 95-98% bulk, c-l mines.....ton	....	45.50	....	45.50	....	37.00
Formaldehyde, bbls, cl & lcl.....lb.	.0645	.0745	.0645	.0745	.0520	.0745
Furfural tech, tks.....lb.	....	.09½	....	.09½	....	.13
Fusel Oil, ref'd, drs, dlvd...lb.	.26½	.29½	.26½	.29½	.18½	.29½
Glauber's Salt, Cryst, bgs, wks.....100 lbs.	1.25	1.75	1.25	1.75	1.05	1.75
Glycerine dynamite, drs, c-l..lb.	.39½	.40¼	.39½	.40¼	.29½	.75¾
Crude Saponification, 88% to refiners tks.....lb.	.23	.32	.23	.32	.23	.60

GUMS						
Gum Arabic, amber sorts bgs.....lb.	.14	.15	.14	.15	.13¾	.15
Benzoin, Sumatra, cs.....lb.	.40	.45	.40	.45	.50	1.00
Copal, Congo No. 1, bgs...lb.	.25	.29	.25	.29	.26	.29
Copal, East India, chips....lb.	no prices		no prices		no prices	
Macassar DBB, bgs.....lb.	.21	.25	.21	.25	.24	.25
Copal Manila.....lb.	no prices		no prices		.25	....
Karaya, bbls, bxs, drs.....lb.	.20	.51	.20	.51	.20	.55

ABBREVIATIONS—Anhydrous, Anhyd; bags, bgs; barrels, bbls; carboys, cbys; carlots, c-l; less than carlots, lcl; drums, drs; kegs, kgs; powdered, pwd; refined, ref'd; tanks, tks; works, f.o.b., wks.

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	Current Low	Current High	1948 Low	1948 High	1947 Low	1947 High
Kauri, N. Y.						
Superior Pale XXX....lb.	no prices		no prices		....	nom.
bgs....lb.	....	.32¾	....	.32¾	....	.31
Sandarac, cks....lb.	.95	1.50	.95	1.50	.85	1.00
Tragacanth, No. 1, cases....lb.	3.60	8.70	3.60	8.70	3.60	8.70
No. 3....lb.	2.00	2.50	2.00	2.50	2.00	3.45
Tacca, bgs....lb.	.06	.07	.06	.07	.06	.07
Hydrogen Peroxide, cbys...lb.	.15½	.18½	.15½	.18½	.15½	.18½
Iodine, Resublimed, jars...lb.	2.35	2.65	2.35	2.65	....	2.65
Lead Acetate, cryst, bbls...lb.	....	.20	....	.20	....	.19¼
Arsenate basic, bg, lcl....lb.	.22¾	.23¾	.22¾	.23¾	....	.23¾
Nitrate, bbls....lb.	.17¾	.20	.17¾	.20	....	.18
Red, dry, 95% PB_3O_4 bbls....lb.	....	.20¼	....	.20¼	.14¼	.19½
97% Pb_3O_4 bbls, delv..lb.	....	.20½	....	.20½	.15	.19½
98% Pb_3O_4, bbls, delv..lb.	....	.21½	....	.21½	.15¼	.19¾
White, bbls....lb.	.16	.16¼	.16	.16¼	.13	.17¾
Basic sulfate, bbls, lcl..lb.	.15¼	.15½	.15¼	.15½	.12½	.15½
Lime, Chem., wks, bulk....ton	6.50	10.25	6.50	10.25	6.50	10.25
Hydrated, f.o.b. wks....ton	8.00	12.14	8.00	12.14	8.00	12.14
Litharge, coml, delv, bbls...lb.	....	.19¼	....	.19¼	.13	.17½
Lithopone, ordi., bgs....lb.	.05½	.06	.05½	.06	.03	.06¾
Magnesium Carb, tech, wks.lb.	.07¼	.10¾	.07¼	.10¾	.07¼	.10¾
Chloride flake, bbls, wks c-l....ton	....	40.00	....	40.00	....	37.00
Manganese Chloride, Anhyd. bbls....lb.	.12¾	.16	.12¾	.16	.14	.16
Dioxide, Caucasian bgs, lcl....ton	74.75	79.75	74.75	79.75	74.75	79.75
Methanol, pure, nat, dms.gal. *l*	.63	1.10	.63	1.10	.63	.73½
Synth, drs cl....gal. *m*	.34½	.41½	.34½	.41½	.31	.41½
Methyl Acetate, tech tks...lb.	.06	.09	.06	.09	.06	.07½
C. P. 97-99%, tks, delv..lb.	.09½	.12	.09½	.12	.09½	.10½
Chloride Indust., cycl, wks....lb.	.16	.41	.16	.41	.32	.41
Ethyl Ketone, tks, frt all'd....lb.	....	.12½	....	.12½	....	.09
Naphtha, Solvent, tks....gal.	....	.30	....	.30	....	.28
Naphthalene, crude, 74°, wks tks....lb.	.04½	.07	.04½	.07	.035	.08 3
Nickel Salt, bbls, NY....lb.	.14	.14½	.14	.14½	.14	.14½
Nitre Cake, blk....ton	no stocks		20.00	24.00	....	24.00½
Nitrobenzene, drs, wks....lb.	.08½	.10	.08½	.10	.08	.09½
Orthoanisidine, bbls....lb.	....	.80	....	.80	....	.70½
Orthochlorophenol, drs....lb.	....	.37	....	.37	.25	.37½
Orthodichlorobenzene, drs..lb.	.07½	.10½	.07½	.10½	.07	.10
Orthonoitrochlorobenzene, wks....lb.	.15	.18	.15	.18	.15	.18
Orthonitrotoluene, wks, drs....lb.	.08	.11	.08	.11	.08	.09½
Paraldehyde, 98%, wks lcl..lb.	.12½	.13½	.12½	.13½	.22	.13
Chlorophenol, drs....lb.	.25	.29	.25	.29	.24	.29
Dichlorobenzene, wks....lb.	.12½	.14	.12½	.14	.12½	.14
Formaldehyde, drs, wks..lb.	.21	.25	.21	.25	....	.22
Nitroaniline, wks, kgs....lb.	.41	.43	.41	.43	.41	.43
Nitrochlorobenzene, wks..lb.	....	.18	....	.18	....	.18
Toluenesulfonamide, bbls.lb.	....	.70	....	.70	....	.70
Toluidine, bbls, wks....lb.	.44	.58	.44	.58	....	.53
Penicillin, ampules per 100,000 units, bulk....	.12½	.19	.12½	.19	.14	.38
Pentaerythritol, tech....lb.	.32	.36	.32	.36	.27	.36
PETROLEUM SOLVENTS AND DILUENTS						
Lacquer diluents, tks, East Coast....gal.	.13	.16	.13	.16	....	.14
Naptha East, tks, wks....gal.	.11	.14	.11	.14	....	.11
Rubber solvents, East, tks, wks....gal.	....	.15	....	.15	....	.12
Stoddard Solvents, East, tks, wks....gal.	.11½	.14	.11½	.14	....	.12
Phenol, U.S.P., drs....lb.	.11¼	.13¼	.11¼	.13¼	.11¼	.13¼
Phthalic Anhydride, cl and lcl. wks....lb.	.14½	.21½	.14½	.21½	.14½	.17½
Potash, Caustics, 88-92%, wks, sol....lb.	.05¾	.09	.06¾	.09	.06¼	.07½
Flake, 88-92%....lb.	.07½	.09½	.07½	.09½	.07	.08¼
liquid, 45% basis, tks..lb.	....	.03½	....	.03½	....	.03½
ds, wks....lb.	.0337½	.0375	.0337½	.0375	.03¼	.04
Carbonate hydrated 83-85%, bbls....lb.	.05¾	.06	.05¾	.06	.06	.05¾
Chlorate crys, kgs, wks...lb.	.08½	.09¾	.08½	.09¾	.08½	.13
Chloride, USP, cryst, bbls....lb.	.21	.27	.21	.27	.21	.22
Cyanide, drs, wks....lb.	....	.55	....	.55	....	.55
Iodide, drs....lb.	1.95	1.98	1.95	1.98	1.44	1.98
Muriate dom, 60-62-63% K_2O bulk unit-ton....	.37½	.53½	.37½	.53½	.37½	.53½
Permanganate, USP, wks drs....lb.	.22½	.24	.22½	.24	.20½	.23
Sulfate, 90%, basis, bgs..ton	36.25	39.25	36.25	39.35	36.25	39.25
Propane, group 3, tks....gal.	.03½	.06¾	.03½	.06¾	.03½	.06¾
Pyridine, reg., drs....lb.	.60	.69	.60	.69	.55	.65
R Salt, 250 lb bbls, wks....lb.	.61	.72	.61	.72	....	.72
Resorcinol, tech. drs, wks...lb.	....	.68	....	.68	.64	.74
Rochelle Salt, cryst....lb.	.31½	.35	.31½	.35	.32½	.35
Salt Cake, dom, blk wks...ton	20.00	28.00	20.00	28.00	....	26.00
Saltpeter, grn, bbls....100 lbs.	8.75	10.25	8.00	10.25	8.20	9.50

l Producers of natural methanol divided into two groups and prices vary for these two divisions; *m* Country is divided into 4 zones, prices varying by zone. Spot price is ½c higher.

Current Prices

Shellac Oils & Fats

	Current Low	Current High	1948 Low	1948 High	1947 Low	1947 High
Shellac, blchd, bone dry, bbls.....lb.	.58½	.77	.58½	.77	.58½	.74½
Silver Nitrate, bots, 2,500-oz. lots.....oz.	.42¼	.48	.42¼	.48	.42¼	.59
Soda Ash, 58% dense, bgs, c-l, wks.....100 lbs.	....	1.50	....	1.50	....	1.38
58% light, bgs cl..100 lbs.	....	1.40	....	1.40	....	1.30
Caustic, 76% flake drs, cl.....100 lbs.	....	3.45	....	3.45	2.90	3.25
76% solids, drs, cl..100 lbs.	....	3.05	....	3.05	2.50	2.85
Liquid, 47-49%, sellers, tks.....100 lbs.	....	2.10	....	2.10	....	2.10
Sodium Acetate, anhyd. drs.....lb.	.06½	.11	.06½	.11	.06½	.11
Benzoate, USP drs.....lb.	.46	.52	.46	52	.46	.52
Bicarb, USP, gran., bgs, cl., works.....100 lbs.	....	2.35	....	2.35	2.25	2.59
Bichromate, bgs, wks l.c.l.....lb.	.08¾	.09¾	.08¾	.09¾	.07⅞	.09¾
Bisulfate powd, bbls, wks.....100 lbs.	3.00	3.60	3.00	3.60	3.00	3.60
35° bbls, wks.....100 lbs.	1.10	1.65	1.10	1.65	1.40	1.65
Chlorate, kgs, wks cl.....lb.	....	.07¼	....	.07¼	....	.06¾
Cyanide, 96-98%, drs.....lb.	.14½	.15	.14½	.15	.14½	.15
Fluoride, 95%, bbls, drs....lb.	.09¾	.10	.09¾	.10	.07¼	.10
Hyposulfite, cryst, bgs, cl. wks.....100 lbs.	....	3.00	....	3.00	....	2.75
Metasilicate, gran., bbl, wks c-l.....100 lbs.	3.25	3.40	3.25	3.40	....	3.40
Nitrate, imp, bgs, c.l....ton	....	48.00	....	48.00	....	42.50
Nitrite, 96-98% bbl, cl...lb.	....	.06¾	....	.06¾	....	.06¾
Phosphate, dianhyd, bgs, wks.....100 lbs.	6.25	7.00	6.25	7.00	6.00	7.00
Tri-bgs, cryst, wks.....100 lbs.	3.40	3.90	3.40	3.90	2.70	3.90
Prussiate, yel. bbls, wks..lb.	.12	.12¼	.12	.12¼	....	.12¼
Silicate, 52°, drs, wks.100 lbs.	1.55	2.00	1.55	2.00	1.40	2.00
40°, drs, wks, c-l...100 lbs.	.95	1.15	.95	1.15	....	1.15
Silicofluoride, bbls, NY..lb.	.05	.08½	.05	.08½	.06¼	.08½
Sulfate tech, Anhyd, bgs.....100 lbs.	2.10	2.60	2.10	2.60	1.70	2.60
Sulfide, cryst c-l, bbls, wks.....100 lbs.	....	3.75	....	3.75	....	3.00
Solid bbls, wks.....lb.	3.50	5.50	3.50	5.50	3.05	5.50
Starch, Corn, Pearl bgs.....100 lbs.	6.37	7.17	6.37	7.17	4.99	7.17
Potato, bgs, cl.....lb.	.0875	.1180	.0875	.1180	.0875	.1075
Rice, bgs.....lb.	no stocks		no stocks		no stocks	
Sweet Potato, bgs.....lb.	no stocks		no stocks		no stocks	
Sulfur, crude, mines.....ton	16.00	18.00	16.00	18.00	16.00	18.00
Flour, USP, precp, bbls, kgs.....lb.	.18	.30	.18	30	.18	.36
Roll, bbls.....100 lbs.	2.45	3.40	2.45	3.40	2.65	3.40
Sulfur Dioxide, liquid, cyl..lb.	....	.09	....	.09	.07	095
tks, wks.....lb.	.04½	.05	.04½	.05	....	.044
Talc, crude, c-l, NY.....ton	....	15.00	....	15.00	....	15.50
Ref'd c-l, NY.....ton	14.50	24.50	14.50	24.50	14.50	24.50
Tin, crystals, bbls, wks.....lb.	.55	.71½	.55	.71½	....	.60
Metal.....lb.	....	1.03	....	1.03	....	.80
Toluol drs, wks,.....gal.	.28	.37	.28	.37	.28	.29½
tks, frt all'd.....gal.	....	.23	....	.23	....	.23
Tributyl Phosphates, drs, lcl, frt all'd.....lb.	.66	.72	.66	.72	....	.72
Triet lorethylene, drs, wks...lb.	.09¼	.10½	.09¼	.10½	.08	.10½
Trichesyl phosphate tks....lb.	.32¼	.36	.32¼	.36	.32¼	.33
Triethylene glycol, drs.....lb.	.18½	.20½	.18½	.20½	.18½	.19½
Triphenyl Phos., bbls.....lb.	.26	.29	.26	.29	.26	.32
Wax, Bayberry, bgs.....lb.	.52	.55	.52	.55	no stocks	
Bees, bleached, U.S.P. cakes.....lb.	.65	.73	.65	.73	.68	.73
Candelilla, bgs, crude....lb.	.61	.65	.61	.65	.62	.80
Carnauba No. 1, Yellow, bgs, ton.....lb.	1.30	1.55	1.30	1.55	1.30	2.00
Xylol, Indus., frt all'd, tks wks.....gal.	.28	.30	.23	.30	....	.23
Zinc Chloride tech, fused, wks.....lb.	.0625	.0655	.0625	.0655	.05	.0655
Oxide, Amer., bgs, wks..lb.	....	.11	.08½	.11	.09	.10
Sulfate, crys, bgs....100 lbs.	4.15	4.90	4.15	4.90	3.40	4.90
OILS AND FATS						
Babassu, tks.....lb.	.14½	.28½	.14½	.28½	.14½	.27½
Castor, No. 3, drs, c.l.....lb.	.20½	.34¼	.26½	.34¼	.27¾	.34¾
China Wood, drs, spot NY..lb.	.23¼	.27	.23¼	.27	.24	.41
Coconut, edible, drs Atlantic ports.....lb.	.18	.27	.18	.27	.18	.37
Corn, crude, tks, wks.....lb.	....	.32	....	.32	....	.31
Linseed, Raw, drs, c.l.....lb.	.2930	.3430	.2930	3430	.3160	.3960
Menhaden, crude tks.....	.18	.22	.18	.22	.19	.22
Light, pressed, drs l.c.l...lb.	.16	.26	.16	.26	.16	.29
Palm, Niger, dms.....lb.	no prices		no prices		no prices	
Peanut, crude, tks, f.o.b. wks.....lb.	.17	.30	.17	.30	.20	.37
Perilla, crude, dms, NY....lb.	no stocks		no stocks		no stocks	
Rapeseed, bulks.....lb.	no prices		no prices		no prices	
Red, dms.....lb.	.17¾	.33¾	.17¾	.33¾	.17¾	.33¾
Soy Bean, crude, tks, wks...lb.	.15½	.29¾	.15½	.29¾	.15¼	.33
Tallow, acidless, dms.....lb.	.19½	.35	.19½	.35	.19½	.35

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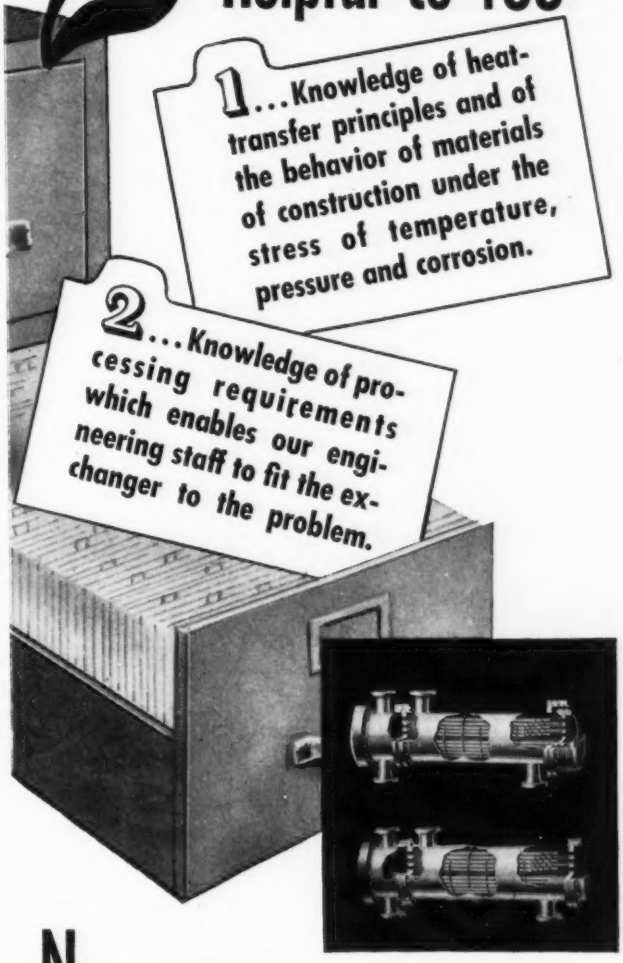

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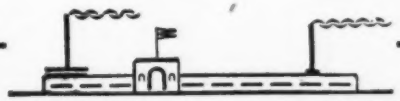

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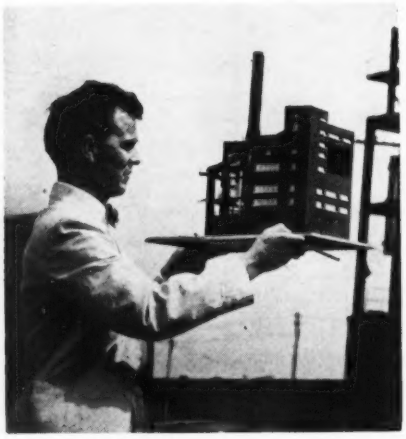
"WE" — EDITORIALLY SPEAKING

WE ARE PLEASED to present a picture of Monsanto's new steam plant at St. Louis, held by Builder Charles Krimmel. One thing we'll have to say for Monsanto: They don't waste a cent on overbuilding. The company was also able to



save a penny here and there on construction materials—even in these days of outlandish prices; for the plant is made of cardboard, scrap wood, and tracing cloth. We've been shouting the last couple of years on our editorial pages about keeping costs down, and we're pleased to see that our importunities have not fallen on deaf ears.

WE'RE NOT an oil chemist, so we're perfectly willing to believe that this "Elaine" that Emery Industries sells, according to its price list, is a flesh-and-blood female. We notice that when Elaine is white, she's worth 2½¢ more per pound than when she is of unspecified color. (Sounds to us like race prejudice rearing its ugly head.) We also notice that her value increases ½¢ per lb. if she's low-titre. That may be OK, but we're not sure: we've never known a low-titre Elaine.

A FIRM in upstate New York, we learn, is now turning out a plastic toy canal (". . . grows with the boy and holds his interest at every stage of development. He can operate it all without spilling, directing river traffic at will.") And the de luxe version, we understand, comes with a circulating pump, "glistening miniature locks," and electrification for remote-control operation.

We still recall with poignant anguish the evening when we—an eager lad of seven at the time—and the paterfamilias became so excited about the finer points of model-railroading that we caught our feet in a lamp cord and sent the delicate, very brittle glass lamp—a wedding gift—crashing to the floor.

That assuring phrase, "without spilling," doesn't impress us at all. A youngster and his Dad can achieve the impossible, and be fooled by the most foolproof mechanism.

FIFTEEN YEARS AGO

(From Our Files of August, 1933)

Chemical Industry's response to N. I. R. A. is a revived Chemical Alliance. A large group of the industry's leaders have met in New York to formulate definite plans so that the industry may work smoothly under the "rules" now laid down for business. A tentative code, largely covering N. I. R. A. wage and working hour requirements has been sent to Washington.

A new method of bleaching has been discovered which gives a fresh appearance to garments which show signs of deterioration. This is said to make wool fabrics a permanent white, not susceptible to yellowing.

The second synthetic ammonia plant in Russia will be built in Chirchiki to supply fertilizers to the cotton fields in that section of the country. Capacity will be about 150,000 tons per year and the Haber-Bosch process will be used. Two nitrogen units are also planned.

Berlin reports that I. G. has increased its domestic sales considerably, but exports have declined due to competition from depressing currencies.

Du Pont has placed an order with General American Transportation for six special tank cars to carry metallic sodium. This will be the first time this chemical has been shipped in tank cars.

THIRTY YEARS AGO

(From Our Files of August, 1918)

The growing scarcity of freight space from the Far East and South America is causing great stringency in crude drugs, dyewoods and some botanicals in both New York and England. Prices are skyrocketing, and it is feared that domestic production will not be sufficient to supply the demand at reasonable prices.

Air Nitrates Corp., owned by the American Cyanamid Co., is planning three new plants, one at Mussel Shoals, Alabama, one near Cincinnati, and a third near Toledo, Ohio. Estimated expenditure, $75,000,000.

"Don't jump, Mr. Ditley! The purchasing department just located some cresol."

HAVING BEEN PLUNGED into melancholy by M. Sartre's gloomy Existentialism, we were more than eager to embrace Resistentialism, which happily takes the blame off Man and explains his troubles by asserting the conscious resistance of Things towards Man—the natural perversity of inanimate objects, if you will. Gonk's Hypothesis, for example, states that no matter how vigorously you shake a shaving brush, the moment you raise it to your face, water will run down your arm. Often the perversity can be turned to good account. If your lawn is parched by drought, for example, leaving a valuable book outside will remedy the situation by causing a cloudburst.

Long before we knew of Resistentialism, we were conscious of its working in the laboratory. It was never the beaker of crude material that broke, but rather the one containing a few milligrams of assiduously recrystallized product. Thermometers always broke in reaction mixtures where mercury had to be excluded.

The skeptics dismiss these catastrophes as the operations of pure chance but we prefer to string along with the Resistentialists and explain them by a fundamental schism between Man and Things—an abiding malevolence, whereby Things seek to discommode and destroy their creators.

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*Organic

Organic isocyantes. No. 2,437,867. John Joseph Verbanc to E. I. du Pont de Nemours & Company.

to The Imperial Trust for the Encouragement of Scientific and Industrial Research.

Cyanoalkyl ethers of polyhydric alcohols. No. 2,437,905. Herman A. Bruson to Resinous Products & Chemical Company.

Cyanoethylating saturated aliphatic ketone. No. 2,437,906.. Herman A. Bruson and Warren D. Niederhauser to The Resinous Products & Chemical Company.

Recovery of phenol from vapor mixture formed by vapor phase oxidation of benzene to phenol at elevated temperatures. No. 2,437,921. Frank Porter to Allied Chemical & Dye Corporation.

Continuous process for preparing ethylene oxide. No. 2,437,930. Ingolfur Bergsteinsson and James R. Scheilbli to Shell Development Company.

Producing pyridine carboxylic acid by partial oxidation of alkyl pyridine. No. 2,437,938. Francis E. Cislak and William R. Wheeler to Reilly Tar & Chemical Corp.

Preparing gamma-dibutylaminopropanol consisting of combining allyl alcohol with dibutylamine in presence of catalyst. No. 2,437,984. Arthur W. Weston to Abbott Laboratories.

Production of thiosophorone, comprises reacting isophorone with hydrogen sulfide in presence of activated bauxite. No. 2,437,-985. De Loss E. Winkler and Seaver A. Ballard to Shell Development Company.

Adding fluorine to double bond of acryclic olefinic compound. No. 2,437,993. Anthony F. Benning and Joseph D. Park to E. I. du Pont de Nemours & Company.

Beta-halogenated unsaturated nitriles. No. 2,437,998. Alfred M. Clifford and Joy G. Lichty to Wingfoot Corporation.

Toluene sulfonic acid treatment of aromatic hydrocarbons. No. 2,438,001. Ralph L. Dockendorff to Standard Oil Development Company.

Preparing fumaric nitrile comprises heating fumaramide, phosphorous pentoxide and powder of metal having electropositive potential less than alkali metals and alkali earth metals. No. 2,438,019. Henry A. Pace to Wingfoot Corporation.

Producing styrene from butadiene. No. 2,438,041. Harris A. Dutcher to Phillips Petroleum Company.

Alpha beta dimethoxy propionitrile. No. 2,438,090. Albert M. Clifford and Joy G. Lichty to Wingfoot Corporation.

Aspartic acid esters and preparation. No. 2,438,091. Kathryn L. Lynch to American Cyanamid Company.

N-sufodicarboxylic acid aspartates. No. 2,438,092. Kathryn L. Lynch to American Cyanamid Company.

Aqueous liquid rosin size composition stabilized against crystallization by incorporation or equal quantities of formaldehyde and amine. No. 2,438,096. Edward N. Poor and Kenneth L. Howard to American Cyanamid Company.

Canadian

Process of making **2-actylsulphanilylaminopyridine** by reacting p-acetylaminobenzene sulphonyl chloride with alpha amino pyridine in a mixture of acetone and pyridine. No. 447,916. George W. Raiziss, Leroy W. Clemence and Morris Freifelder (to Abbot Laboratories).

Reacting N-acyl sulphanyl halide with amino-thiazoline to form an acyl sulphanilylamino-thiazoline reaction product and then subjecting the reaction product to a deacylation treatment to form a **sulphanilylamino-thiazoline compound.** No. 447,917. George W. Raiziss, Leroy W. Clemence and Morris Freifelder (to Abbot Laboratories).

2-chlorobutadiene-1, 3 by subjecting 2,2,3,-triclorobutane to vapor phase pyrolysis at a temperature of 300° to 600° C. in the presence of copper and copper compounds. No. 447,926. Oliver Wilfred Cass (to Canadian Industries, Ltd.).

Preparation vinyl chloride, passing a mixture of acetylene and hydrogen chloride over a preformed catalyst consisting of thoroughly dispersed mercurous chloride commingled with a porous carrier. No. 447,936. Wilbur Arthur Lazier and Gerald Messner Whitman (to Canadian Industries, Ltd.).

Compound of the formula CH_2-CXF-CHCl-CH_2, wherein X is a member of the group consisting of chlorine and fluorine. No. 447,933. Frank Willard Johnson (to Canadian Industries, Ltd.).

Production of an acrylyl compound which comprises adding vinylidene chloride to a mixture of sulphuric acid and a member of the group consisting of formaldehyde and polymers thereof. No. 447,934. Nancy Short (to Canadian Industries, Ltd.).

Producing acrolein and ethylene which comprises heating 2:3 dihydropyran at a temperature exceeding 350° C. No. 447,980. John George Mackay Bremner and David Gwyn Jones (to Imperial Chemical Industries, Ltd.).

Production of butadiene by subjecting the substantially anhydrous vapors of crotyl chloride to thermal, non-catalytic dehydroclorination. No. 448,012. George W. Hearne and George A. Stenmark (to Shell Development Co.).

Producing beta-beta-dichlordiethyl thio-ether, the steps of contacting hydrogen sulphide with vinyl chloride. No. 448,013. William E. Vaughan and Frederick F. Rust (to Shell Development Co.).

Manufacture of cyclohexene from cyclohexane which comprised contacting cyclohexane with a catalyst comprising a metal halide of the Friedel-Crafts type under napthene isomerizing conditions effecting the conversion of cyclohexane to methylcyclopentane, contacting the resulting methylcyclopentane with a dehydrogenating catalyst under dehydrogenating conditions effecting the conversion of methylcyclopentane to methylcyclopentenes, and contacting the resulting methylcyclopentenes with a solid olefin isomerizing catalyst. No. 448,014. Hervey H. Voge (to Shell Development Co.)

Preparing an alkyl halide by reacting an olefin with a hydrogen halide in the presence of a metal halide catalyst. No. 448,020. Egi V. Fasce (to Standard Oil Development Co.).

Preparing chlorine substitution products of olefine which comprises introducing chlorine into a body of a liquid comprising a tertiary olefin at the rate of at least 0.05 mol of chlorine per mol of olefin per minute, while maintaining in the reaction zone a temperature substantially below the boiling point of the olefin at the prevailing pressure. No. 448,021. Hyym E. Buc and Clifford W. Muessig (to Standard Oil Development Co.).

Condensing 4.4'-diamino-diphenyl-sulphone-hydrohalides, ammonium-halides, tertiary amine-hydrohalides while simultaneously subjecting the reactants to heating. No. 448,035. Robert Behnish and Paul Pohls (to Winthrop Chemical Co., Inc.).

Separating a coal tar base from a mixture of coal tar bases, which comprises reacting said mixture with phosphoric acid to precipitate a part of the base mixture as base phosphate, removing the precipitated base phosphate from the reaction mixture and converting said base phosphate to free base. No. 448,099. Karl Henry Engel (to Allied Chemical & Dye Corp.).

Talloel esters of organic sulphonic acid salts of amino alcohols having at least one of the radicals of the group consisting of primary amino radicals and secondary amino radicals. No. 448,100. David W. Jayne, Jr., and Harold M. Day (to American Cyanamid Co.).

Production of branched chain alkanes from normal alkanes containing more than three carbon atoms in the molecule. No. 448,102. Eric William Musther Fawcett and Gwilyn I. Jenkins (to Anglo-Iranian Oil Co., Ltd.).

Making chloranil by chlorinating pentachlorophenol suspended in sulphuric acid of 96-100 per cent concentration at elevated temperature not exceeding 150° C. and hydrolizing the resulting reaction product. No. 448,130. William Pieter ter Horst, Charles Harmer Stiteler and Glenn Purcell Smith (to Dominion Rubber Co., Ltd.).

Chlorinating phthalic compounds whereby chlorine is directly attached to the ring nucleus of the phthalic molecule, which method comprises the use of ferric chloride as the sole substantial source of the chlorine. No. 448,149. Charles C. Clark and Paul H. Baker (to Mathieson Alkali Works).

Process comprising oxidizing 4.4'-di (aclyamino)-diphenyl sulphide with sodium hpyochlorite, in aqueous solution. No. 448,151. John Weijlard and John Paul Messerly (to Merck & Co., Inc.).

Process for the production of butene-2 from a hydrocarbon mixture containing butene-1 and isobutylene. No. 448,177. Walter H. Peterson and John Anderson (to Shell Development Co.).

Process for converting pentane to isopentane. No. 448,178. Chester C. Crawford and William E. Ross (to Shell Development Co.).

Process for the production and recovery of cyclohexane from a hydrocarbon mixture comprising methylcyclopentane and open chain paraffins having six and seven carbon atoms to the molecule. No. 448,179. William E. Ross and Philip Pezzaglia (to Shell Development Co.)

Purifying a 2-mercoptoarylenethiazole which comprises treating an aqueous slurry of the 2-mercaptoarylenethiazole with carbon bisulphide, displacing the water on the 2-mercaptoarylenethiazole with said carbon bisulphide, recovering the carbon bisulphide-wetted 2-mercaptoarylenethiazole and separating the 2-mercaptoarylenethiazole from the carbon bisulphide. No. 448,209. Harold Peregoy Roberts (to Wingfoot Corp.)

Obtaining absolute alcohol from aqueous mixtures with ethyl ether in an azeotropic distillation. No. 448,246. Theodore O. Wentworth.

Morpholine octadecyl amino carbimide. No. 448,249. Vartkes Migrdichian (to American Cyanamid Company).

A guanyl urea alkyl hydrogen sulphate reacting dicyandiamide, sulphuric acid and a primary or secondary alcohols. No. 448,-250. David Walker Jayne, Jr., and Harold Milton Day (to American Cyanamid Company).

**U.S. Patents from Vol. 607, Nos. 2, 3, 4. Vol. 608, Nos. 1, 2, 3. Canadian from April 20-May 11*

Preparing acetylhydrazino di-amino s-triazine which comprises effecting reaction between hydrazino diamino s-triazine and acetic anhydride. No. 448,271. Gaetano F. D'Alelio and James W. Underwood (to General Electric Company, Limited).

In the demuriation of halogen-bearing organic compounds, the improvement which comprises conducting the demuriation in the presence of a catalyst comprising an intimate mixture of a phosphate of alkaline earth metal with the phosphate of a metal of variable valence of Series 4 of the periodic table. No. 448,316. John C. Michalek and Edwin R. Erickson (to The Mathieson Alkali Works).

Effecting reaction between an unsaturated hydrocarbon and an aromatic compound substituted in the nucleus by an hydroxyl radical which comprises effecting initial condensation between the aromatic compound and said unsaturated hydrocarbon in the presence of an acid catalyst. No. 448,343. John Frank Olin and John LeRoy Tetley (to Sharples Chemical, Inc.).

A continuous process for removing carbon monoxide from hydrogen by catalytic conversion to methane. No. 448,344. Frederic Marinus Pysel (to Shell Development Company).

A process for the production of cyclopentadiene from dichlorcyclopentane which comprises subjecting the substantially anhydrous vapors of the latter to thermal, non-catalytic dehydrochlorination in the absence of a basic reagent. No. 448,349. George W. Hearne and Donald S. La France (to Shell Development Company).

Process for effecting the selective hydrogenation of cyclopentadiene to cyclopentene. No. 448,350. Theodore W. Evans, Edward C. Shokal and Rupert C. Morris (to Shell Development Company).

Ethyl iodophenylvalerate. No. 448,367. William H. Strain, Stafford L. Warren and John T. Plati to Noned Corporation and Eastman Kodak Company.

Process for the oxidation of a heterocyclic nitrogen compound containing in its structure a pyridine nucleus substituted by an oxidizable organic grouping. No. 448,396. James Ogilvie and Alvin J. Sweet (to Allied Chemical and Dye Corporation).

A continuous process for the preparation of acetylenic alcohols, by introducing into a cooled, finely divided, suspension of potassium hyoxide in an ether compound selected from the group consisting of acetals and polyethers, a 1-alkyne, having a terminal hydrogen atom in the 1 position, adding to the resultant mixture a carbonyl compound selected from the group consisting of an aliphatic aldehyde of from four to eight carbon atoms, and aliphatic ketones. No. 448,428. Everet F. Smith (to Commercial Solvents Corporation).

In a process for the synthesis of acetylenic alcohols, the improvements which comprise heating a mixture containing potassium hydroxide, a water-insoluble inert liquid and a monohydric alcohol until said potassiumhydroxide is in a partially or completely molten state, absorbing a 1-alkyne having a hydrogen atom in the one-position in the cooled mixture, subsequently introducing into said mixture a carbonyl compound selected from the group consisting of an aliphatic aldehyde containing from four to eight carbon atoms, and aliphatic ketones. No. 448,429. Everet F. Smith (to Commercial Solvents Corporation).

In a method of recovering butadiene from a mixture of butadiene and C_4-monoolefins. The steps which comprise reacting said mixture with chlorine under such conditions that the C_4-monoolefins are substantially converted into dichlorobutanes while the butadiene is substantially unaffected. No. 448,441. David Craig (to The B. F. Goodrich Company).

Condensing a benzenesulfonhalide having in the p-position a group convertible into NH_2, with an aniline substituted in the p-position by an acyl group, and converting said convertible group into NH_2. No. 448,456. Claus Diehl (to Merck & Co.)

Process for the production of thiourea by reacting sodium sulphide, calcium cyanamide, and calcium chloride in aqueous solution. No. 448,457. Jacob van de Kamp (to Merck & Co., Inc.).

Method of producing sulphanilamidopyridines comprising reacting an aminopyridine with p-acetaminobenzenesulphonyl-chloride, hydrolyzing off the acetyl group with dilute acid, precipitating the free base with an alkali and purifying the compound thus produced. No. 448,461. Bernard Francis Duesel.

Process of purifying 3-picoline contaminated by the co-presence of at least one of the bases 4-picoline and 2,6-lutidine, which consists in heating the contaminated 3-picoline with a compound of the class consisting of aliphatic and aromatic organic-acid anhydrides and aliphates and aromatic organic acid halides, and separating the unreacted 3-picoline from reaction products. No. 448,470. Francis E. Cislak and William R. Wheeler (to Reilly Tar & Chemical Company).

Process for the production of isopentane by contacting pure normal pentane fraction, with an isomerization catalyst of the Friedel-Crafts type in the presence of a hydrogen halide promoter and an added minor effective amount of cyclopentane. No. 448,472. Chester C. Crawford, William E. Ross and Sumner H. McAllister (to Shell Development Company).

Process for converting pentane to isopentane which comprises contacting pentane in the liquid phase with a molten quaternary mixture comprising aluminum chloride, sodium chloride, potassium chloride and zinc chloride. No. 448,473. Harry A. Cheney and Frank M. McMillan (to Shell Development Company).

In a process for the catalytic dehydrogenation of halogen-free hydrocarbons with the aid of sulf-active catalysts consisting essentially of a piled dehydrogenating metal sulphide, the improvement which comprises periodically restoring the dehydrogenating activity of said catalyst by treatment in situ with sulphur dioxide. No. 448,474. Raymond C. Archibald (to Shell Development Company).

Process for isomerizing naphthenic hydrocarbons. No. 448,475. William E. Ross and Theodore Vermeulen (to Shell Development Company).

*Packaging

Bag structure comprising outer flexible walled supporting member having inner independently formed liner therein constructed of suitable non-porous waterproof material, and web of porous sheet material bent upon itself and inserted into liner. No. 2,435,743. William J. Geimer to Bemis Bros. Bag Company.

Method and apparatus for sealing containers. No. 2,435,747. Carl H. Larson to The Adlake Company.

Fibre reinforced collapsible container. No. 2,435,917. Philip Zalkind.

Liquidproof lined carton and blank for forming same. No. 2,436,061. Harry F. Waters.

Self-sealing closure for containers. No. 2,436,291. Lewis H. Daniel.

Machine for making can bodies from tubing that has been flattened into double walled ribbon form. No. 2,436,409. Ivan D. Thornburgh to American Can Company.

Capsulating apparatus. No. 2,436,439. John H. Lincoln and Lyle E. Branchflower to Laucks Laboratories, Inc.

Apparatus for mixing dry and liquid materials and loading into containers. No. 2,437,216. Jack P. Wilson, Herbert T. Lewis, Jr., and Donald C. Glassford to Proctor & Schwartz, Inc.

Heat-sealed valve bag. No. 2,437,693. Carl Henry Hartman to St. Regis Paper Company.

Canadian

Bag closure for fabric bags which is removable by tearing without damage to the bag. No. 447,920. Roslyn B. Fortuin (to Bemis Bro. Bag Co.).

Bag having an inturned portion forming a valve, a sleeve therein formed of a sheet of paper with an outer layer of thermoplastic material thereon and folded about a central longitudinal line to form a sleeve, and having its inner and folded over to bring said thermoplastic layer in contact with the outer surface of the inner end of the inturned valve portion and having its longitudinal edges and its outer end folded in to bring the thermoplastic material in contact theralong. No. 448,011. Carl Henry Hartman (to St. Regis Paper Co.)

Non-staining container for sulphur-containing foodstuffs comprising an adherent coating of an alloy of tin and indium with the quantity of indium between substantially one-tenth and two per cent by weight of the coating. No. 448,126. Arthur E. Stevenson (to Continental Can Co.).

Gas-tight powder dispenser. No. 448,129. George M. Skinner (to Dominion Oxygen Co., Ltd.).

Laminated container. No. 448,453. Robert A. Farrell and Charley L. Wagner (to Marathon Corporation).

*Paper and Pulp

Peroxide bleaching of ground wood of type rich in tannin and color bodies ground wood of brightness at least equal to that which obtains by peroxide bleaching of ground spruce wood. No. 2,435,566. Daniel O. Adams & George B. Hughey to West Virginia Pulp and Paper Co.

Canadian

Improving the dimensional stability of cardboard paper products adapted for use in making business machine cards of the perforated card type, which comprises dipping such cardboard having a thickness of at least 0.005 inch for not more than 5 seconds in a solution consisting essentially of water and methylolureas. No. 447,942. Hamline Monroe Kvalnes (to Canadian Industries, Ltd.).

Bleaching mechanical wood pulp first treating the pulp with a water solution of a non-reducing mineral acid at a relatively low pH less than 3 and thereafter treating the pulp under alkaline conditions with a peroxide to brighten the pulp. No. 448,268. Robert L. McEwen (to Buffalo Electro-Chemical Company, Inc.).

Process of producing lignin material from black liquor. No. 448,476. George H. Tomlinson and George H. Tomlinson, Jr. (to Howard Smith Paper Mills, Limited).

*Petroleum

Facilitating removal from lubricating oil of colloidal impurities produced therein during operation of internal combustion engine. No. 2,435,707. Ulric B. Bray and John K. Russell.

Continuous two-stage process for production of synthetic isoparaffinic oils boiling in range 400° to 800° F. No. 2,435,708. Alva C. Byrns to Union Oil Company of California.

Recovery of shale oil from oil shale comprises commingling oil shale with hot flue gas removing flue gas, heating oil shale with hot lean shale gas and superheated steam. No. 2,435,746. Philip H. Jones to Union Oil Company of California.

Producing normally liquid hydrocarbons comprises reacting mono-olefinic hydrocarbon and monohaloalkane in presence of phosphoric acid catalyst at conversion conditions of temperature and pressure. No. 2,435,983. Louis Schmerling to Universal Oil Products Company.

Cracking of hydrocarbon oils with finely divided heat resistant non-catalytic material. No. 2,436,160. Forrest H. Blanding to Standard Oil Development Company.

Finishing of aviation naphthas. No. 2,436,170. Boyd N. Hill to Standard Oil Development Company.

Process and apparatus for thermal cracking of hydrocarbons. No. 2,436,254. Sylvander C. Eastwood and Robert D. Drew to Socony-Vacuum Oil Company, Incorporated.

Obtaining high yields of hydrocarbons boiling within gasoline boiling range from recycle petroleum cracking stock having A. P. I. gravity of less than 15°. No. 2,436,257. Rowland C. Hansford and Alexander N. Sachanen to Socony-Vacuum Oil Company.

Surface combustion cracking furnace. No. 2,436,282. Edwin O. Bennett to Continental Oil Company.

Conversion of hydrocarbons using moving catalysts. No. 2,436,340. John D. Upham and I. Louis Wolk to Phillips Petroleum Company.

Fluid catalytic cracking. No. 2,436,464. Edward M. Van Dornick.

Process in which mixture of gaseous hydrocarbon constituents is scrubbed with aqueous metallic salt solution which is liquid and capable of selectively taking up at least one of constituents. No. 2,436,471. William B. Franklin to Standard Oil Development Company.

Production of hydrocarbons boiling in gasoline range comprises alkylating isobutane with propylene and butylene, separately alkylating isopentane with propylene in presence of hydrogen fluoride at 75° F. to 150° F. while maintaining molar ratio of isopentane to propylene of from 5:1 to 20:1, to produce isobutane concurrently with alkylated is-pentane, supplying isobutane to first-mentioned alkylatin gstep. No. 2,436,483. Robert J. Newman to Universal Oil Products Company.

Isomerization process comprises contacting isomerizable saturated hydrocarbon with isomerizing catalyst in presence of relatively minor amount of partially hydrogenated polynuclear

**U.S. Patents from Vol. 607, Nos. 2, 3, 4. Vol. 608, Nos. 1, 2, 3. Canadian from April 20-May 11*

aromatic hydrocarbon. No. 2,436,484. Herman Pines to Universal Oil Products Company.

Operating catalytic cracking process employing finely divided solid catalyst particles in regeneration zone and two conversion zones. No. 2,436,486. Fred W. Scheineman to Standard Oil Company.

Treating hydrocarbon feed stock comprises contacting feed stock with solution comprising major portion of aryl sulfonic acid and minor portion of sodium meta arsenite dissolved in organic solvent at a 100° to 400° F. No. 2,436,494. George H. Shipley, Jr., and Glenn W. Wilson, Jr., to Standard Oil Development Company.

Process and apparatus for adsorptively and catalytically treating hydrocarbon oil. No. 2,436,495. Arthur D. Smith to Adsorptive Process Company.

Catalytic conversion of hydrocarbons. No. 2,436,496. Arthur D. Smith to Adsorptive Process Company.

Improved lubricating oil comprising major portion of wax-free oil in lubricating oil range, separated from paraffin base crude petroleum, minor portion of wax separated from naphthenic base crude petroleum and minor portion of condensation product formed by condensing chlorinated paraffin wax with aromatic hydrocarbon. No. 2,436,565. Donald B. Gillett to Standard Oil Development Company.

Synthesis of hydrocarbons from carbon oxides and H_2 in presence of suitable catalyst. No. 2,436,568. Lindsay I. Griffin and Charles E. Jahnig to Standard Oil Development Company.

Polymerization of olefins. No. 2,436,571. Raymond L. Heinrich to Standard Oil Development Company.

Converting methane into higher boiling hydrocarbons. No. 2,436,595. Edward W. S. Nicholson and Aaron K. Redeay to Standard Oil Development Company.

Method of preventing excessive buildup of isobutylene content in recycle stock of dehydrogenation system for production of butadiene from n-butene wherein isobutylene is produced as by-product. No. 2,436,600. Edward D. Reeves to Standard Oil Development Company.

Conversion of higher boiling hydrocarbons into lower hydrocarbons suitable for motor fuel. No. 2,436,618. William J. Sweeney to Standard Oil Development Company.

Conversion of hydrocarbon oils comprises passing relatively heavy oil boiling above end point of naphtha through cracking zone at active cracking temperature above 700° F., etc. No. 2,436,622. Charles W. Tyson to Standard Oil Development Company.

Method for removal of traces of water from mixtures of hydrogen chloride with low-boiling hydrocarbons. No. 2,436,900. Perry L. Roberts to Phillips Petroleum Company.

Hydrocarbon conversion process. No. 2,436,922. Henry W. Grote to Universal Oil Products Company.

Demethylation of hydrocarbon containing more than 4 carbon atoms per molecule and selected from paraffins, olefins alkyl aromatics and saturated alkyl hydro-aromatics. No. 2,436,923. Vladimer Haensel to Universal Oil Products Company.

Continuous method of producing liquid motor fuels from coal. No. 2,436,938. Walter G. Scharmann and Frank T. Barr to Standard Oil Development Company.

Catalytic isomerization of saturated hydrocarbons wherein hydrocarbon is subjected to action of metal halide isomerizing catalyst in presence of hydrogen halide. No. 2,436,944. Robert E. Sutherland to Universal Oil Products Company.

Catalytic synthesis of hydrocarbons with controlled recycle of carbon dioxide. No. 2,436,957. Du Bois Eastman to The Texas Company.

Catalytic process for synthesis of hydrocarbons and the like from hydrogen and oxides of carbon. No. 2,436,962. Leon P. Gaucher to The Texas Company.

Hydrocarbon fuel oil. No. 2,437,041. Wayne A. Proell to Standard Oil Company.

Reacting carbon monoxide and hydrogen at elevated temperatures by contact with catalyst. No. 2,437,051. Eugene E. Sensel and Roland A. Beck to The Texas Company.

Continuous alkylation of isoparaffin with alkylating agent in presence of H_2SO_4 catalyst. No. 2,437,091. Arthur R. Goldsby and Claude W. Watson to The Texas Company.

Conversion of high boiling petroleum fractions to valuable lower boiling products. No. 2,437,222. John A. Crowley, Jr., and Oswald G. Hayes to Socony-Vacuum Oil Company, Inc.

Removing hydrocarbons and acidic gas from mixture of gases. No. 2,437,288. Ray B. Anderson.

Refining of hydrocarbon oil containing mercaptans by treatment thereof with solution comprising alkali and organic solvent selected from methanol, ethanol, propanol, acetone, ethylene glycol and glycol ethers. No. 2,437,348. Kenneth M. Brown and Clarence G. Gerhold to Universal Oil Products Company.

Separating degenerated catalyst from fluidized solid catalyst hydrocarbon conversion system. No. 2,437,352. Nathan Fragen to Standard Oil Company.

Catalytic alkylation of aromatic hydrocarbons by long chain olefins. No. 2,437,356. Philip Hill to Standard Oil Company.

Separation of unsaturated hydrocarbons from saturated hydrocarbons contained in hydrocarbon fraction. No. 2,437,357. Art C. McKinnis to Union Oil Company of California.

Catalytic process for isomerization of hydrocarbon vapors in presence of metal-halide catalyst. No. 2,437,394. Harold R. Legatski to Phillips Petroleum Company.

Producing gasoline and other hydrocarbons from coconut oil and related animal and vegetable oils and fats. No. 2,437,438. Sergius Petroff and Anthony E. Prats.

New method of treating petroleum crudes to substantially eliminate destructive coking in heat-and-pressure conversion into products of distillation. No. 2,437,439. Elmer H. Records.

Production of petroleum hydrocarbons through well wherein hydrocarbon flow stream contains constituent tending to cause corrosion of well tubing, method of mitigating corrosion comprises placing within well granular mass of ion exchange material to remove corrosive constituent. No. 2,437,475. William F. Oxford, Jr., to Sun Oil Company.

Catalytic treatment of hydrocarbons. No. 2,437,531. Hal C. Hugman to Union Oil Company of California.

Catalytic reforming of hydrocarbons. No. 2,437,532. Hal C. Huffman to Union Oil Company of California.

Forming isoparaffinic hydrocarbons from lower boiling paraffinic and olefinic hydrocarbons. No. 2,437,544. Milton M. Marisic to The Pure Oil Company.

Catalyst for isomerisation of normal aliphatic hydrocarbons. No. 2,437,948. Eric William Musther Fawcett, Gwilym Islwyn Jenkins and John Habeshaw to Anglo-Iranian Oil Company.

Treating hydrocarbons with aqueous alkaline treating liquid to effect separation of components of mixture, soluble in treating liquid. No. 2,438,018. Alan C. Nixon and David Louis Yabroff to Shell Development Company.

Canadian

Mineral lubricating oil containing 0.01 to 1 per cent of a dialkyl diphenol thio-ether having only one alkyl group connected to each phenol radical. No. 448,017. Louis A. Mikeska and Charles A. Cohen (to Standard Oil Development Co.)

Lubricant comprising a hydrocarbon lubricating oil base and a sulphurized polymer of a semi-drying oil dissolved in said lubricating oil base. No. 448,019. Jones I. Wasson (to Standard Oil Development Co.)

Separating oil from bituminous sand by pulping and heating such sands with water. No. 448,231. Karl Adolf Clark.

A regenerative process for extracting a single liquid containing components of different degrees of ease of extaction wherein mercaptans are extracted from a sour hydrocarbon oil with an aqueous solution of an alkali metal hydroxide containing a solubility promoter for said mercaptans. No. 448,345. Albert V. Caselli and Alan C. Nixon (to Shell Development Co.).

In the process of manufacturing asphalts wherein a precipitated asphalt is oxidized and blended with a flux, the improvement comprising blowing with air as a blown asphalt as asphaltene content of 45 per cent to 65 per cent. No. 448,347. Lawrence L. Lovell, Donald C. Isted and Roman Leo Ortynsky (to Shell Development Company).

In a process for treating a liquid hydrocarbon mixture with a strong oxy acid, the steps comprising mixing with said acid to effect said treatment and to produce sludge. No. 448,348. Samuel F. Good (to Shell Development Company).

An asphaltic composition. No. 448,351. Stanley S. Sorem (to Shell Development Company).

In the decolorizing of oil by contact with a decolorizing earth wherein the earth containing coloring matter extracted from the oil is removed for reactivation involving treatment with a color solvent capable of extracting coloring matter from the earth. No. 448,356. William Provine Gee (to Texaco Development Company).

*Photographic

Bleaching Bath and process for bleaching color film. No. 22,997, Frank J. Kaszuba to General Aniline & Film Corporation.

Processes of color photography and compositions and elements therefor for utilizing sulphonamide color formers. No. 2,435,629. Andrew B. Jennings to E. I. du Pont de Nemours & Company.

Tripack film with emulsion layers adjacent each other. No. 2,435,957. Jack C. Crawford.

Dye intermediates for colour photography. No. 2,436,007. John David Kendall and Douglas James Fry to Ilford Limited.

Vacuum envelope for photographic printing. No. 2,436,085. Charles F. Amering to Eastman Kodak Company.

Photographic emulsions of silver salts in hydraphilic polymers of 1,3-dioxolane. No. 2,436,138. Theodore Le Seur Cairns and David Malcolm McQueen to E. I. du Pont de Nemours & Company.

Nondiffusing 1-phenyl-5-pyrazolone couplers for color photography. No. 2,437,063. Walter Zeh, Kreis Bitterfeld, Whilhelm Schneider, and Alfred Fröhlich to General Aniline & Film Corporation.

Increasing sensitivity of gelatino-silver halide emulsion layer. No. 2,437,412. Walter J. Weyerts and Charles W. Wiederhold to Eastman Kodak Company.

Canadian

Developing photographic emulsions of relatively high silver iodide content, which comprises carrying out the development in a solution containing a soluble thallium compound and a developer. 447,972. James E. Bates (General Aniline & Film Corp.)

Photographic element comprising a support having at least one light-sensitive layer comprising the hydrophilic (3-methyi-1-phenyl-5-pyrazolon-5-yl) methyl ether/benzaldehyde-o-sulphonic acid acetal of a hydrolyzed ethylene/vinyl acetate interpolymer having light-sensitive silver halides dispersed therethrough. 447,936. David Willcox Woodward (to Canadian Industries, Ltd.).

*Polymers

Forming laminated fiber-cement product comprising mixing fibers, a hydraulic binding agent and water. No. 2,435,646. John Arthur Cann to Turner & Newall Limited.

Composition comprising 100 parts of polymeric halogenated styrene taken from group consisting of polymerized mono-, and difluoro bromo, and chloro styrenes and from 0.01 to 1.0 part of member of group consisting of dicyclohexylamine and its alkyl substitution products. No. 2,435,767. Costas H. Basdekis to Monsanto Chemical Company.

Color stable resin comprises polymer of vinyl chloride having therein from 0.05 to 5% of formamide. No. 2,435,769. La Verne E. Cheyney and Carl R. Parks to Wingfoot Corporation.

Preparation of quaternary ammonium polyacrylates. No. 2,435,777. Frank J. Glavis and Harry T. Neher to Röhm & Haas Company.

Adhesive composition comprising aqueous dispersion of polyvinyl acetate and pinewood extract. No. 2,435,909. Norman G. Tompkins to Dewey and Almy Chemical Company.

Composition of terpinene-maleic anhydride, hydrogenated coumaroneindene resin, and polystyrene. No. 2,436,048. Irving C. Matthews and William F. Lynch to Eastman Kodak Company.

Apparatus for molding colored articles of organic plastic plastic material. No. 2,436,065. Charles S. Dewey, Jr. to Shaw Insulator Company.

Oils and greases obtained by pyrolysis of tetrafluoroethylene-olefin copolymers. No. 2,436,069. Robert M. Joyce, jr. to E. I. du Pont de Nemours & Company.

Resinous composition of urea-aldehyde and hydrolyzed interpolymer of a vinyl ester. No. 2,436,080. Albert Faris Smith to E. I. du Pont de Nemours & Co.

**U.S. Patents from Vol. 607, Nos. 2, 3, 4. Vol. 608, Nos. 1, 2, 3. Canadian from April 20-May 11*

Production of strain-free extruded shapes from organic thermoplastic materials. No. 2,436,201. Paul M. Cole to E. I. du Pont de Nemours & Company.

Copolymers comprising acrylonitrile and vinyl esters and molecularly oriented articles composed thereof. No. 2,436,-204. Gaetano F. D'Alelio to Pro-phy-lac-tic Brush Company.

Adhesive cement composition comprising elastoprene organic dilsocyanate and non-reactive volatile organic solvent. No. 2,436,222. Arthur M. Neal and John J. Verbane to E. I. du Pont de Nemours & Company.

Interpolymerizing olefins of different molecular weights. No. 2,436,238. Edward F. Wadley and Joseph T. Horeczy to Standard Oil Development Company.

Composition comprising polyvinyl acetal resin stabilized with basic alkali metal compound and amine salt. No. 2,436,253. Richard D. Dunlop to Monsanto Chemical Company.

Preparing ethylene polymers consists in subjecting ethylene under oxygen-free conditions at 100° to 350° C. at of 200 to 3000 atmospheres to action of catalyst containing positive halogen catalyst being of group consisting of hypochlorites and substances which yield hypochlorites on hydrolysis with dilute alkali. No. 2,435,256. William E. Hanford and Paul L. Salzberg to E. I. du Pont de Nemours & Co.

Phenol formaldehyde resin-glycinin protein emulsion. No. 2,436,328. Philip K. Porter to Westinghouse Electric Corporation.

Phenol formaldehyde resin-glycinin protein emulsion. No. 2,436,329. Philip K. Porter to Westinghouse Electric Corporation.

Hand tool for forming films on flat surfaces from plastic materials. No. 2,436,351. John J. Bradley, Jr. to Boston Varnish Company.

Obtaining resins. No. 2,436,363. Carl Shipp Marvel.

Improved calender for treatment of fabric with plastic. No. 2,436,446. George B. Nichols to Seiberling Rubber Company.

Hydrocarbon resin-sulfurized oil composition. No. 2,436,456. Frank J. Soday to The United Gas Improvement Company.

Desulfurization polymerized isobutylene to sulfur content of less than 0.01% comprising treating polymerized isobutylene in liquid phase with dehydrated alumina containing no more than 3% water. No. 2,436,550. Richard C. Brandon to Standard Oil Development Company.

Laminated fabric comprising paper having grease or wax on surface and firmly joined there to similar sheet of paper by means of intermediate film of non-acid adhesive comprising emulsion of animal glue and water immiscible volatile solvent for wax or grease. No. 2,436,596. Henry Francis Noakes and James Robert Martyn to E. I. du Pont de Nemours & Company.

Solid styrene polymer formation at low temperatures. No. 2,436,614. William J. Sparks, Henry B. Kellog and Donald C. Field to Standard Oil Development Company.

Preparing alkyd type resin comprises heating in closed system a mixture of dicyclopentadiene, maleic anhydride and substance of a class consisting of monoglycerides of acids of a glyceride drying oil, diglycerides of said acids and mixtures of said acids and glycerol, etc. No. 2,436,641. Howard L. Gerhart and Leon M. Adams to Pittsburgh Plate Glass Company.

Polymerization process for polymerization of liquid, olefinic material to solid polymers at temperatures between 0°C. and —110°C. No. 2,436,767. Robert A. Gerlicher to Jasco, Incorporated.

Method comprising dissolving solid polymer of styrene in propylene oxide and to solution adding quantity of methanol to precipitate polystyrene. No. 2,436,841. Arthur J. Warner to Federal Telephone and Radio Corporation.

Polymerization (1) acrylic acid nitrile or mixture of acrylic acid nitrile together with minor proportion of another copolymerizable, unsaturated compound to obtain dimethyl formamide-soluble polymer. No. 2,436,926. Ralph Albert Jacobson to E. I. du Pont de Nemours & Co.

Polymerization of olefinic hydrocarbons. No. 2,436,929. Carl B. Linn to Universal Oil Products Company.

Polymerizing sugars comprises reducing sugar to molten state and heating same under anhydrous conditions in contact with superheated steam, as catalyst. No. 2,436,967. Gerald J. Leuck to Corn Products Refining Company.

Stabilization against change in molecular weight of linear polyester. No. 2,437,046. David A. Rothrock, Jr. and Richard F. Conyne to The Resinous Products & Chemical Company.

Condensation products of quinones with active ethylene compounds. No. 2,437,087. Marshall De Motte Gates, Jr.

Sulfuric acid polymerization of diorganosiloxanes. No. 2,437,204. Rob Roy McGregor and Earl Leathen Warrick to Corning Glass Works.

Copolymers of styrene and a betacyanoacrylate. No. 2,437,231. David T. Mowry to Monsanto Chemical Company.

Stabilization of polyesters from dihydric alcohols and both saturated and unsaturated dicarboxylic acids. No. 2,437,232. David A. Rothrock, Jr. and Richard F. Conyne to The Resinous Products & Chemical Company.

Producing resinous polymer from methyl indene. No. 2,437,-278. Frank J. Soday to The United Gas Improvement Company.

Aqueous emulsion comprising as essential ingredient copolymerization product of drying oil with ester obtained in reacting cyclopentadiene-maleic adduct, fatty acid having from 5 to 22 carbon atoms in chain and polyhydric alcohol. No. 2,437,293. William H. Butler to Bakelite Corporation.

Making plastic contact lenses. No. 2,437,436. John E. Mullen.

Copolymers of mixtures comprising allyl and methallyl ether esters. No. 2,437,508. Gaetano F. D'Alelio to General Electric Company.

Resinous butylated urea-formaldehyde condensation product which is reaction product of urea, formaldehyde and butyl alcohol plasticized with resinous reaction product of phthalic

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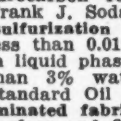

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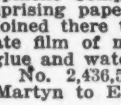

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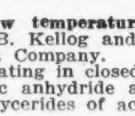

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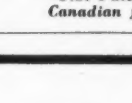

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acid, glycerol and 2-ethyl hexoic acid. No. 2,437,657. Herbert J. West and Henry M. Enterline to American Cyanamid Company.

Producing laminated product having craze-resisting and pigmented surface. No. 2,437,799. Nelson Richard Yorke to St. Regis Paper Company.

Producing molding compounds comprising furfuryl alcohol reaction products. No. 2,437,955. Herman L. Hersh to Owens-Illinois Glass Company.

Copolymers of allyl esters of poly-basic acid with saturated monohydric alcohol esters of unsaturated polycarboxylic acid. No. 2,437,962. Edward L. Kropa to American Cyanamid Company.

Plastic composition comprising inter-polymer consisting of styrene and fumarobinitrile. No. 2,437,966. David T. Mowry to Monsanto Chemical Company.

Chlorobenzalacetone copolymer. No. 2,427,980. Raymond B. Seymour and David T. Mowry to Monsanto Chemical Company.

Water-soluble phenolic adhesive for making hot press plywood. No. 2,437,981. John Thomas Stephan, Reino Alexander Jarvi and Jacob Richard Ash to Monsanto Chemical Company.

Ethylene-polyhaloethylene reaction products. No. 2,438,021. John Richard Roland to E. I. du Pont de Nemours & Company.

Preparing thermoset composition from thermoplastic copolymer of vinyl chloride and vinylidene chloride. No. 2,438,097. Thomas H. Rogers, Jr. and Robert D. Vickers to Wingfoot Corporation.

Vinyl halide resin resisting discoloration upon heating. No. 2,438,102. Fred W. Cox and James M. Wallace, Jr. to Wingfoot Corporation.

Canadian

Copolymer of an ethenyloxyacetic acid ester with a polymerizable olefin hydrocarbon of not more than five carbon atoms and of molecular weight above 30 which has a methylene group attached by an ethylenic double bond to the remainder of the molecule. No. 447,931. Donald Drake Coffman (to Canadian Industries Ltd.)

Laminated article comprising a sheet of methyl methacrylate polymer and a sheet of polyvinyl butyral resin. No. 447,932. Maurice Leon Ernsberger and Paul Swithin Pinkney (to Canadian Industries Ltd.)

Producing monomeric tetrafluorethylene which comprises heating polymeric tetrafluorethylene at a temperature of 600°C-700°C under a reduced pressure not exceeding about 150 millimeters of mercury. 447,938. Ernest Eugene Lewis (to Canadian Industries Ltd.)

Process for obtaining an improved hydrolyzed ethylene/vinyl organic ester interpolymer filament. No. 447,939. Halsey Bidwell Stevenson (to Canadian Industries Ltd.)

Retarding gelation at elevated temperatures of liquid methyl polysiloxane containing average of two methyl groups per silicon atom. No. 2,437,501. Charles A. Burkhard and Winton I. Patnode to General Electric Company.

Polymer of acrylonitrile containing in a polymer molecule at least 85 per cent by weight of acrylonitrile and a compound embraced by the formula:

$[Cn(-CO-N(CH_3)_2)m]\,[Cp(-CH-CN)_s]\,[Cr(-CH-SCN)u]\,CvXW$

wherein X represents a member of the class consisting of $=CH-SO_2-$, $=CH-SOO-$, $=CH-SO_2-$, and $=CHSO-$ the free valence of the sulphoxy group being also attached to carbon, m, q and u are integers at least equal to zero, w is an integer at least equal to 1, n, p, r and v are integers of such value that n/m does not exceed 1.5, p/q does not exceed 1.5, r/u does not exceed 0.5 and v/w does not exceed 2, all valences of said compound other than those contained in carbon-to-carbon linkages and not shown as satisfied in the formula being satisfied by a substituent taken from the group consisting of hydrogen halogen, oxygen, bivalent sulphur, hydroxyl, thio, cyano, thiocyano and sulphoxy, the total number of said halogen, oxygen, sulphur, hydroxyl and thiol substituents not exceeding the sum (m+q+u+w) and the number of cyano, thiocyano and sulphoxy groups not exceeding the sum (m+q+u+w). No. 447,940. Ray Clyde Houtz (to Canadian Industries, Ltd.).

A polymer of acrylonitrile containing in the polymer molecule at least 85 per cent by weight of acrylonitrile and a dimethyl carbamyl compound. No. 447,941. George Henry Latham (to Canadian Industries Ltd.)

Flexible sheet comprising porous fibrous web and an internal bonding agent present in the sheet to the extent of 40 to 60 percent of weight thereof and including a copolymer of butadiene and a mono-unsaturated compound. No. 447,990. Laszlo W. Eger and Edward W. Engel (to Johnson & Johnson Ltd.)

Resinous product comprising the water-free and insoluble reaction product, under heat treatment of an aminated phenol aldehyde resin and a resin solvent and cross-linking hardening agent that is an alkylating polyhalide. No. 448,157. Loring Coes, Jr. (Norton Co.)

Copolymer comprised of 4 parts by weight of 2,3-chlorobutadiene-1,3 from 1 to 16 parts of butadiene-1,3 and from 5 to 40 per cent (based on the total content of the butadiene) of vinylidene chloride. No. 448,207. Albert M. Clifford and William D. Wolfe (to Wingfoot Corp.).

Preparing copolymers of butadiene-1,3 and an aliphatic acrylonitrile by polymerization in a medium containing an emulsifying agent and a peroxide oxidant, the step which comprises agitating and heating the reaction mixture in a closed atmosphere containing oxygen in amount not over 0.5 per cent by weight of the total monomers present, other than that combined in the form of water vapour. No. 448,208. William D. Wolfe (to Wingfoot Corp.)

Light weight gas-impervious laminated composition which comprises a continuous sheet of a popolymer of 40 to 80 per cent of vinylidene chloride and 20 to 60 per cent of a vinyl ester cemented to a woven fabric of linear polyamide resin fibres by means of an adhesive comprising a polymer of 70 to 100 per cent of vinyl chloride. No. 448,213. Oscar William Loudenslager and Joseph E. Wilson (to Wingfoot Corp.)

Mouldable acetone-insoluble polymer of vinyl chloride a plasticizer for said polymer and 8 to 15 per cent of sulphur based on the weight of the composition. No. 448,220. William Ivan Taylor (to Claude George Bonard).

Insulated electrical conductor comprising a conductor and an insulation of vinyl acetate-vinyl chloride copolymer containing not more than 15 per cent of the acetate and plasticized with hydrogenated methyl abietate and dioctyl phthalate. No. 448,269. Ansley O. Blades to General Cable Corporation.

Process for manufacture of a protein plastic which comprises as steps precipitating fibrinogen from blood plasma, drying and mixing it while in a finely-divided condition with another protein selected from the group consisting of albumin and globulin, and with a plasticizer. No. 448,302. Edwin Joseph Cohn and John Douglass Ferry to Research Corporation.

Process for the manufacture of plastics which comprises removing the corpuscles from blood while preventing clotting of the fibrinogen constituent, treating the resulting plasma for the precipitation of fibrinogen drying and mixing with a plasticizer. No. 448,303. John Douglass Ferry to Research Corporation.

Method of producing a moulding composition that comprises coating fluffed glass fibres with a solution of a melamine-formaldehyde condensation product. No. 448,310. David E. Cordier to Libby-Owens-Ford Glass Company.

A thermoplastic resin comprising polymerized nuclear-substituted dichlorostyrene. No. 448,315. John C. Michalek to The Mathieson Alkali Works.

Process for producing a benzene-soluble polymer of cyclopentadiene by the catalytic polymerization comprising admixing cyclopentadiene, a solvent, and a hydrolyzable boron trifluoride-organic solvent complex. No. 448,362. Samuel Gottlieb to The United Gas Improvement Company.

Making a dry adhesive film from a urea-formaldehyde condensation product. No. 448,373. Ove Emil Blackman.

A composition comprising (1) the product of polymerization of a mass comprising a vinyl halide and (2) toloxy leas oleate. No. 448,413. Ronald W. Staley to Canadian Electric Company, Limited.

Method of forming an impervious well-bonded laminate which comprises impregnating a fibrous material with a liquid mixture containing an organic peroxy compound and an ester having at least two unsaturated groups deriving by esterification of a monohydroxy alcohol which has an unsaturated linkage in an aliphatic straight carbon chain and which has said unsaturated linkage attached to the second carbon atom from the hydroxy group and heating said impregnated composition to induce polymerization. No. 448,466. Irving Elkin Muskat to Pittsburgh Plate Glass Company.

*Processes and Methods

Conditioning surfaces for use under conditions such that traces of water constitute a contaminant, comprises rinsing surfaces with non-aqueous rinse consisting of non-aqueous hydrophobic organic solvent in which is dissolved oil soluble amine salt of coumaroneindene resin modified alkylated naphthalen sulfonate. No. 2,435,925. Willard H. Kirkpatrick and Doyne L. Wilson to Visco Products Company.

Method of treating finely-divided material, comprises feeding layer of material upon horizontally placed hearth provided with V-shaped troughs extending from feed end to discharge end of hearth, injecting stream of fluidizing gas into and transversely of bottom of trough, etc. No. 2,436,157. Carl J. Westling to Minerals and Metals Corporation.

Separating liquid mixture including organic polyhydric alcohol and water. No. 2,436,209. Joseph Clifton Elgin to Colgate-Palmolive-Peet Company.

Vapor phase solvent extraction process. No. 2,436,472. Edward F. Wadley to Standard Oil Development Company.

Pretreatment of reaction zone to subsequent catalytic conversion of hydrocarbons in presence of anhydrous hydrogen halide and aluminum chloride supported upon porous solid, reaction zone initially including iron oxide in small amounts and porous solid free of aluminum chloride. No. 2,436,564. Otto Gerbes to Standard Oil Development Company.

Vacuum dehydration process including evolved vapor condensation. No. 2,436,693. Kenneth G. D. Hickman to Distillation Products, Inc.

Continuously pelleting finely divided solids. No. 2,436,771. Ralph S. Hood to Monsanto Chemical Company.

Continuous osmotic diffusion and gravity stratification dialysis of lacteal fluid. No. 2,437,080. Frederick K. Daniel to Sun Chemical Corporation.

Removing soil from article by washing with water, steps comprising adding to water, water soluble alkaline earth compound, etc. No. 2,437,253. Lloyd F. Henderson and Bernard L. Maxwell to Lever Brothers Company.

Conducting endothermic chemical reaction in presence of solid catalyst in powdered condition at high temperature with short contact time between reaction material and catalyst. No. 2,437,334. Bruno E. Roetheli to Standard Oil Development Company.

Conversion of hydrocarbons by contact with hot granular solid at conversion temperature followed by cooling reaction mixture below conversion temperature. No. 2,437,383. Swanton D. Dalton, Socony-Vacuum Oil Company.

Apparatus for treating granular materials. No. 2,437,395. Folke GÖsta Robert Magnusson and Gustav Valdemar Oholm.

Dislodging material clogging an opening through which it is desired to conduct fluid, includes step of: transmitting sound waves under conditions of resonance through body of liquid contacting such material. No. 2,437,456. Albert G. Bodine, Jr. to The Calpat Corporation.

Distillation from film by diffusion into gas stream. No. 2,437,594. Orban Denys to Distillation Products, Inc.

Storage means for liquefied gas. No. 2,437,909. Howell C. Cooper.

Continuous method for catalytic conversion of gaseous reactants by contact with solid catalyst in particle form at predetermined temperature. No. 2,438,029. Harold V. Atwell to The Texas Company.

Canadian

Process of distilling tar which comprises flowing tar in a restricted stream of narrow cross-section heating without substantial vaporization introducing heated tar from the stream into expansion zone to volatilize a substantial portion

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of the normal oil content, cooling the vapours to condense heavy creosote oil and flowing the residual vapours through a series of condensing zones. No. 448,395. Joseph Zavertnik to The Barrett Company.

*Rubber

Synthetic-rubber resulting from polymerization of aqueous emulsion of mixture consisting of 60 parts butadiene-1,3 and 40 parts ethyl alpha-phenylacrylate. No. 2,435,674. Albert M. Clifford to Wingfoot Corporation.

Rubber-like copolymer containing in interpolymerized relation about 60 to 75 parts of butadiene-1,3, about 40 to 25 parts of acrylonitrile and about 1 per cent to 3 per cent of the total weight of butadiene and acrylonitrile of methyl methacrylate. No. 448,210. Albert Mitchell Clifford and William Donald Wolfe (to Wingfoot Corp.)

*Specialties

Dry cement composition comprising hydraulic cement and .01% to .6%, of residuum solids of feremnted sulfite liquor. No. 2,435,594. Donald R. MacPherson to The Master Builders Company.

Composition comprising proportion of mineral lubricating oil and V. I. improving amount of polyester condensation product of reaction of compound selected from dicarboxylic acids and lower aliphatic esters of dicarboxylic acids with glycol. No. 2,435,619. David W. Young and William J. Sparks to Standard Oil Development Company.

Oxidation stable and rust inhibiting hydrocarbon oil composition comprising hydrocarbon oil normally susceptible to oxidation and lacking rust inhibiting properties and from 0.001% to 0.1% of a betanaphthol, from 0.001% to 3% of N-phenyl-alpha-naphthylamine, from 0.0005% to 0.5% stearic acid, from 0.0005% to 1% naphtheno-hydroxamic acid. No. 2,435,655. Herbert D. Rhodes, George F. Rouault and Claron N. White to Standard Oil Company.

Insect repellent comprising solution of alpha-cyano-beta-furylidene-acetic acid ethyl ester in di-lower alkyl phthalate. No. 2,435,780. Ralph E. Heal to Merck & Company, Inc.

Demulsifying composition comprising mixture of 17% to 90% by weight of surface-active ester of aliphatic sulfopolycarboxylic acid and 83% to 10% aspartate amide of aliphatic sulfopolycarboxylic acid. No. 2,435,810. Emil A. Vitalis to American Cyanamid Company.

Pre-fused flux for arc welding. No. 2,435,852. Leonidas K. Stringham to The Lincoln Electric Company.

Hydraulic fluid consisting of 0.7% by weight up to saturation of acrylic resin rendered water-soluble by acrylic carboxylate groups in form of quarternary ammonium salt groups, and fluid medium. No. 2,435,950. Harry T. Neher and Frank J. Glavis to Röhm & Haas Company.

Quick drying printing ink composition for application to web material used in manufacture of containers. No. 2,435,992. Herbet J. Wolfe and Paul W. Greubel to American Can Company.

Normally liquid soluble-oil composition comprising major proportion of hydro-carbon oil, from 5% to 11% of sodium soap of preferentially oil-soluble petroleum sulfonic acid having molecular weight above 450. No. 2,436,046. Norman E. Lemmon and Frederick W. Schuessler to Standard Oil Company.

Normally liquid lubricant composition comprising major proportion of a hydrocarbon oil and from 0.05% to 10% of zinc organo trithiocarbonate of group consisting of zinc alkyl triocarbonate and zinc alicyclic trithiocarbonate. No. 2,436,-051. Lawson W. Mixon to Standard Oil Company.

New composition of matter, substantially dry and chemically stable mixture comprising pectic acid and sodium bicarbonate. No. 2,436,086. Willard E. Baier to California Fruit Growers Exchange.

Electric cable impregnated with tertiary alkyl naphthalenes. No. 2,436,110. Robert G. Larsen to Shell Development Company.

Buffing composition comprising, azelaic acid, solid polyethylene glycol and abrasive uniformly mixed together. No. 2,436,128. Robert W. Twyning and William T. Hakken, Jr. to J. C. Miller Company.

Phosphorescent device comprising resin of the methacrylic type carrying 10% of strontium sulphide, 3% of stabilizer selected from aluminum stearate, calcium borate, aluminum borate and glycerol monostearte, 5% of plasticizer selected from dibutyl phthalate and tri-cresyl phosphate, and carrying blue-green dye. No. 2,436,182. Gilbert T. Schmidling.

Jelly having vegetable gum base and containing small percentage of phenyl-mercurial salt, and buffer system consisting of borax and at least one material of group consisting of water-soluble polyhydroxy compounds with two OH groups in cis relation on adjacent carbon atoms. No. 2,436,184. William B. Stillman and Albert B. Scott to Eaton Laboratories.

Flameproofing composition comprising thermally unstable chlorinated resinous material, material capable of reacting with hydrogen chloride to form deliquescent chloride not appreciably volatile below 300°C., said material being from class consisting of zinc oxide and ferric hydroxide, water insoluble higher fatty acid, and water insoluble metallic soap. No. 2,436,216. Earl W. Leatherman.

Preparing casein adhesives. No. 2,436,239. Samuel M. Weisberg and Wedin G. Stimpson to National Dairy Research Laboratories, Inc.

Rubber-like copolymer of butadiene and acrylonitrile plasticized with isobutyl beta isobutoxy propionate. No. 2,435,773. Albert M. Clifford and Joy G. Lichty to Wingfoot Corporation.

Recovering water-insoluble solid polymerized olefinic material from aqueous emulsion containing sodium lauryl sulfate as emulsifier. No. 2,435,778. Albert J. Gracia to Wingfoot Corporation.

Copolymer of from 20 to 80% of butadiene-1,3, isoprene or 2,3-dimethyl-butadiene-1,3 and from 20 to 80% of compound having structural formula described in patent. No. 2,435,790. John R. Long to Wingfoot Corporation.

Compounding butadiene-acrylonitrile copolymer with alcohol ester of mono alkenyl substitute succinic acid. No. 2,435,855. Leslie T. Sutherland to Allied Chemical & Dye Corporation.

Synthetic rubberlike materials comprising fluoroprene. No. 2,436,213. Frederick B. Hill, Jr. to E. I. du Pont de Nemours & Company.

Dimethyl silcone elastomers containing lead monoxide. No. 2,436,220. James Marsden and George F. Roedel to General Electric Company.

Composition comprising material selected from natural rubber and rubber-like polymers of butadiene; and heat polymer of residual tar. No. 2,436,332. Philip Edward Rollhaus to The United Gas Improvement Company.

Insulating material containing cyclized rubber, polyolefine, and polystyrene. No. 2,436,842. Arthur J. Warner and Myron Bakst to Federal Telephone and Radio Corporation.

Artificial rubber from vinyl resin, phenolaldehyde resin, and plasticizer. No. 2,437,284. Benjamin W. Watson.

Vulcanizable copolymers of vinyl, aryl compound, butadiene, and vinyl ethers. No. 2,437,420. Gaetano F. D'Alelio to Prophy-lac-tic Brush Company.

Vulcanizable copolymers of acrylonitrile, butadiene and vinyl ethers. No. 2,437,421. Gaetano F. D'Alelio to Prophy-lac-tic Brush Company.

Composition comprising reclaimed vulcanized natural rubber, octadecane nitrile, sulfur, triphenyl guanidine, and butadiene-acrylonitrile synthetic rubber. No. 2,437,538. John H. Kelly, Jr. Dryden Rubber Company.

Veneering elastomers. No. 2,437,855. Elden Earl Leach, Jr. to E. I. du Pont de Nemours & Company.

Making rubber extenders. No. 2,437,925. Laszlo Auer to Ridbo Laboratories, Inc.

Canadian

Mineral oil composition comprising viscous mineral oil having in admixture therewith minor proportion, to impart anti-rusting characteristics of ester product of malic acid. No. 2,436,272. George H. S. Snyder, Ralph V. White, John H. Bishop and John F. Socolofsky to Socony-Vacuum Oil Company.

Alloy electroplating process comprises electrolyzing aqueous alkaline cyanide electrolyte containing 0.01 to 5 ounces per gallon of at least one water soluble, surface active quaternary ammonium compound selected from group consisting of compounds having formular; described in patent. No. 2,436,316. John C. Lum and George W. Jernstedt to Westinghouse Electric Corp.

Low temperature grease. No. 2,436,347. John C. Zimmer and Arnold J. Morway to Standard Oil Development Company.

Composition of matter comprising 10% to 90% of sulfurized fatty oil and 90% to 10% of hydrocarbon oil. No. 2,436,457. Frank J. Soday to The United Gas Improvement Company.

Producing aerosols comprising container for holding liquid, air pump in container having plurality of apertures for discharge of air from pump, etc. No. 2,436,478. Arthur W. Lindquist, Chester N. Husman and Herman O. Schroeder.

Mineral lubricating oil containing dissolved therein an oxidation-inhibiteing amount of zinc isopropyl xanthate. No. 2,436,589. John P. McDermott to Standard Oil Development Company.

Bituminous bonding composition comprising solid substances, an asphalt and 0.1 to 1% by weight of 1.10 diamino decane. No. 2,436,599. Chester L. Read and Anthony H. Gleason to Standard Catalytic Company.

Solvent for degreasing iron and aluminum comprising trichlorethylene containing 0.02 to 1% by weight of alkyl ester of nitrogen acid selected from alkyl nitrates containing 2 to 4 carbon atoms and alkyl nitrites containing 3 to 6 carbon atoms. No. 2,436,772. Walter Klabunde to E. I. du Pont de Nemours & Co.

Typographic printing ink comprising pigment dispersed in varnish consisting of phenol-formaldehyde resin soluble in difficultly volatile petroleum distillates having dimethyl sulfate values of above 6.0, etc. No. 2,436,791. Frank W. Cray to Interchemical Corporation.

Cosmetic preparation comprising an emolient and a small amount of finely divided coarse fraction of dehulled oats. No. 2,436,818. Sidney Musher to Musher Foundation, Incorporated.

Dielectric composition comprising polychloroprene, wax, age resistor, and antioxidant. No. 2,436,885. Louis P. Gould and John W. Whiteside to General Motors Corporation.

Printing ink vehicle which is press stable at normal pressroom temperatures. No. 2,436,954. Richard A. Denton to Sun Chemical Corporation.

Process of tanning with chromates of lignin sulfonic acids. No. 2,437,044. Edwin A. Robinson and Ralph M. Beach to Nopco Chemical Company.

Controlling viscosity of aqueous drilling fluid employed in drilling well comprises treating fluid with water-insoluble monometaphosphate having cation selected from alkali metals and ammonium together with monometaphosphate of an at least colloidally soluble salt having dissimilar cation selected from alkali metals and ammonium and anion consisting of radical of aliphatic carboxylic acid. No. 2,437,297. Allen D. Garrison to Texaco Development Corporation.

Producing flexilizing agent for wrinkle coating compositions consisting in heating mixture of conjugated double-bonded oil and non-drying oil to 540° F. maintaining temperature of 530° to 540° F. until gellation is about to start; adding further quantity of non-drying oil whereby gellation is checked, etc. No. 2,437,369. William Allshire Waldie to New Wrinkle, Incorporated.

Hardening soil consists in treating soil with solution of material selected from calcium and magnesium chlorides, and with solution of material selected from sodium and potassium hydroxides, thereafter treating soil with solution of sodium silicate. No. 2,347,387. Ronald Mortimer Hodgson.

Aqueous solution for use in bath for coloring copper or copper alloy surfaces consisting of sodium chlorite and hydroxide selected from sodium hydroxide and potassium hydroxide, and phosphate salt selected from trisodium phosphate, tripotassium phosphate, sodium tetraphosphate, potassium tetraphosphate, hexametasodium phosphate, hexameta potassium phosphate, pyrophosphates and polyphosphates. No. 2,437,441. Linnaeus Joslyn Rogers to Associated Chemical Company of Canada, Limited.

Cleaning and preparing metal articles for plating, comprising removing carbonaceous film by subjecting article anodically to current which immersed in aqueous alkaline cleaning bath. No. 2,437,474. Gilbert H. Orozco to Gilron Products Co.

**U.S. Patents from Vol. 607, Nos. 2, 3, 4. Vol. 608, Nos. 1, 2, 3. Canadian from April 20-May 11*

Cosmetic preparation for care of skin containing member selected from naturally-occurring multi-unsaturated fatty acids and their naturally-occurring esters, plus nicotinamide. No. 2,437,651. Fritz Schaaf to Ciba Pharmaceutical Products, Incorporated.

Treating bark for production of cork, fiber and bark powder. No. 2,437,672. Herman W. Anway to Weyerhaeuser Timber Company.

Printing ink consisting of coloring material, alkane diol, and resinous binder. No. 2,437,908. Caesar Frank Chiappe, and John William Kroeger, to Fred'k H. Levey Co., Incorporated.

Treating tomatoes, comprises immersing them in 60% solution of calcium chloride maintained at 280° F., and removing exocarp freed by immersion. No. 2,437,937. David Childs, Albert E. Braun and James Hanson to Libby, McNeill & Libby.

Producing aerosols. No. 2,437,963. Irving Langmuir and Vincent J. Schaefer to General Electric Company.

Fluent finish remover suitable for removing paints, enamels, varnishes and lacquers comprising diethyl phosphite combined with thickening agent. No. 2,437,964. Paul E. Marling to Monsanto Chemical Company.

Relaxing keratinous material comprises treating with water-soluble bisulphite. No. 2,437,965. Edwin B. Michaels and Bernard Lustig to Lawrence Richard Bruce, Incorporated.

Canadian

Preparation for cleaning furniture, silver, automobiles, enamels and other objects. No. 447,890. Marie-Jeanne Boivin.

Cutting oil base emulsifiable with water, comprising a mineral lubricating oil, a sulphurized fatty oil, and emulsifying agent, a polyhydric alcohol ether, and a sufficient amount of alkaline material to provide a pH value for the entire composition slightly in excess of 10. No. 448,018. John C. Zimmer and John B. Holtzclaw (Standard Oil Development Co.).

Process of controlling the viscosity of well drilling mud, which comprises adding thereto water-insoluble potassium metaphosphate, and water-insoluble sodium metaphosphate. No. 448,141. Norman E. Martello (to Hall Laboratories, Inc.).

Lessening or eliminating the water-attracting or water-absorbing properties of a primary aromatic amine-formaldehyde resin to which a poly halogen compound (excluding fluorine compounds) has been added. No. 448,156. Loring Coes, Jr. (to Norton Co.).

Producing a substantially non-hygroscopic and non-aging organic retarder for gypsum plasters which comprises hydrolizing 100 parts of a protein with water with from 2 to 5 parts of an alkali metal hydroxide in the presence of from 20 to 30 parts of calcium hydroxide. No. 448,418. Harry N. Huntzicker (to United States Gypsum Company).

*Textiles

Improving properties of textile materials dyed with vat dyestuffs. No. 2,435,591. Albert Landolt to Society of Chemical Industry in Basle.

Discharge printing of colored cellulose acetate fabrics with aid of intermediate thiocyanate treatment. No. 2,436,059. Herbert G. Scull and James G. McNally to Eastman Kodak Company.

Stabilizing, against progressive, dimensional shrinkage under repeated washings, textile material predominantly of regenerated cellulose. No. 2,436,076. Edward C. Pfeffer, Jr., and Jack Epelberg to Cluett, Peabody & Co., Inc.

Continuous filament consisting of acid-coagulated hardened wool fiber. No. 2,436,156. Robert William Upson to E. I. du Pont de Nemours & Company.

Improved blanket for textile printing machines. No. 2,436,761. William C. Ross and Stephen B. Neiley to Dewey and Almy Chemical Company.

Producing tire cord having denier of at least 500 comprises treating filamentary material with composition comprising oil selected from vegetable, marine and mineral oils, and ester of fatty acid containing at least 12 carbon atoms with polyhydric alcohol. No. 2,436,979. George Standley and Kenneth M. McLellan to Industrial Rayon Corporation.

Producing tire cord having denier of at least 500 comprises treating filamentary material with composition comprising compound selected from sulphated and sulphonated derivatives of mineral oils, vegetable oils, marine oils, higher fatty acids and higher fatty alcohols, and an ester of fatty acid. No. 2,436,980. George P. Standley and Kenneth M. McLellan to Industrial Rayon Corporation.

Producing filaments of substantial strength from thermoplastic material. No. 2,437,263. Fred W. Manning.

Making non-woven fabric from fluid plastic. No. 2,437,264. Fred W. Manning.

Extrusion of fusible organic filament-forming composition. No. 2,437,685. Henry Dreyfus to Celanese Corporation of America.

Production of artificial materials by extrusion of fused thermoplastic compositions. No. 2,437,686. Henry Dreyfus to Celanese Corporation of America.

Making self-binding fabric having woven textile base. No. 2,437,689. Carelton S. Francis, Jr., to American Viscose Corporation.

Extrusion of fusible organic filament-forming composition. No. 2,437,703. Robert Wighton Moncrieff to Celanese Corporation of America.

Extruding fusible filament-forming materials. No. 2,437,704. Robert Wighton Moncrieff and William Pool to Celanese Corporation of America.

Canadian

Controlling the proportion of soluble lead in spinning baths for use in the manufacture of yarn from viscose, which comprises treating the spinning bath with controlled amounts of sodium trithiocarbonate. No. 447,996. Kenneth E. Smith (to Northern American Rayon Corp.).

Finishing a textile material by applying a dispersion containing a xanthate of a deeply degraded water-insoluble derivative of a cellulosic body. No. 448,044 Antonie Lilienfeld.

Process for making highly elastic resilient filaments, threads, yarns and other textile articles, made of a water-insoluble vinyl resin formed by the conjoint polymerization of a vinyl halide with a vinyl ester of an aliphatic acid, and elasticizer for said vinyl resin consisting of the higher alkyl esthers of dicarboxylic acids. No. 448,427. Theophilus A. Field, Jr., (to Carbide and Carbon Chemicals, Limited).

Process of making artificial fibers from a spinnable protein solution. No. 448,499. Antonio Ferretti.

Process for the manufacture of artificial textile fibers consisting essentially of casein. No. 448,500. Antonio Ferretti.

*Nuclear Processes

Isotope separation process. No. 2,435,796. Allen Francis Reid.

Differential twin chamber neutron meter. No. 2,437,476. Herbert M. Parker.

Agriculture

Controlling fattening rate of livestock and poultry comprising steps of administering to animal during limited selected period of life span substance of low toxicity containing thiourelyene radical —NH:CS:NH— in amount equivalent to range of 0.01% to 0.15% for each 100 pounds of feed. No. 2,438,353. Charles W. Turner and Ezra P. Reineke (to American Dairies Incorporated).

Canadian

Process for influencing the growth of plants by application to the medium surrounding the root system of a water-soluble metal salt of a fluorescent dye-stull obtained by bringing the water-insoluble fluorescent dye into chemical reaction with one of the metal oxides selected from the group of alkaline and alkaline earth metal oxides. No. 448,797. Margit Sellei and Helen Beretvas.

Biochemical

Producing citric acid by submerged fermentation comprising subjecting sugar material to action of "aspergillus niger" in agitated, aqueous solution containing nutrient mineral substances and milk, passing oxygen-containing gas through solution. No. 2,438,136. Joseph Szues.

Cellulose

An alkyl cellulose stabilized with an N,N, dialkylated diamine. No. 2,438,975. John Edward Jones (to Celanese Corp.)

Process of forming porous artificial masses of regenerated cellulose. No. 2,439,034. Orlando A. Battista (to American Viscose Corp.).

Cellulose acetate butyrate plasticized with alkyl abietates and the hydrogenated alkyl abietates. No. 2,439,093. Lester W. A. Meyer (to Eastman Kodak Co.).

Fractional precipitation of cellulose butyrates. No. 2,439,111. John W. Tamblyn, Donald R. Morey (to Eastman Kodak Co.).

Canadian

Producing mineral wood from the waste lye product obtained from the sodium cellulose manufacture. No. 448,503. Goste Yngve Schotte and Hans Evert Otto Nordin.

Process of preparing cellulose nitrate. No. 448,694. Lee Landis Blyler (to Canadian Industries Limited).

Unwoven carded cotton cellulosic fibrous material impregnated with an alkali soluble alkyl hydroxy cellulose. No. 448,768. Joseph G. Curado and August C. Finalborgo (to Sun Chemical Corp.).

Bleaching cellulosic materials by an initial purification with chlorine, hypochlorous acid, and alkali metal and alkaline earth hypochlorites later treating with chlorine dioxide. No. 448,883. Ferri Casciani and Gordon K. Storin (to Niagara Alkali Company).

Ceramics

Porous refractory of a double silicate of zirconium and a metal taken from the group consisting of lithium, sodium, potassium, magnesium, calcium, barium and strontium. No. 22,997. Charles J. Kinzie and Eugene Wainer (to The Titanium Alloy Manufacturing Company).

Making ceramic stain ranging from ivory through yellow in shade, comprises mixing pure zirconium oxide with ammonium metavanadate, calcining mixture in furnace to 2550° F. grinding the resultant product. No. 2,438,335. John Alfred Earl (to The Vitro Manufacturing Company).

Yellowish white, crystalline, crushable, homogeneous substance useful in ceramic glazes and characterized by low solubility in boiling 4% acetic acid. No. 2,438,524. Forrest L. Turbett and Harry B. Stephenson, Jr. (to The Eagle-Picher Company).

Heat cast refractory consisting of baddeleyite, corundum and siliceous glass. No. 2,438,552. Theodore E. Field (to Corhart Refractories Company).

Manufacturing ceramic materials of high permittivity comprising mixing together first portion of wet milled barium titanate and second portion of dry milled barium titanate, in proportion of 1% to 70% of wet milled barium titanate and 99% to 30% of dry milled barium titanate, fabricating mixture of wet and dry milled portions of barium titanate into shape for conventional treatment and firing. No. 2,438,761. Edward Charles Martin (to Hartford National Bank & Trust Company).

Glass resulting from a batch containing: Lithium oxide, 8 to 18 percent or 27 to 38 cationic percent; beryllium oxide, 3 to 16 weight percent or 3 to 18 cationic percent; aluminum oxide, 2.5 to 23 weight percent or 2 to 10 cationic percent; cationic percent; boron oxide, 21 to 45 weight percent or 30 to 40 cationic percent. No. 2,439,192. Kuan-Han Sun and Thomas E. Callear (to Eastman Kodak Co.).

Canadian

A porcelain enamelled article having an opaque coating containing ZrO_2, P_2O_5 SiO_2, B_2O_3, Al_2O_3, F_2. No. 448,575. Monroe John Bahnsen and Eugene Edward Bryant (to Ferro Enamel Corporation).

Coatings

Dispersion of synthetic graphite in volatile liquid for coating surfaces by drying through volatilization. No. 22,985. Austin T. Collins.

Forming selenium-containing protective coating on article, which is composed principally of magnesium. No. 2,438,740. Charles William Clark and Warren Arthur Sheaffer (to Canadian Copper Refiners Limited).

U.S. Patents from Vol. 607, Nos. 2, 3, 4. Vol. 608, Nos. 1, 2, 3.
Canadian from April 20-May 11
Additional patents from the above volumes will be given next month.

Trademarks of the Month

A Checklist of Chemical and Chemical Specialties Trademarks

482,777. Advanco Laboratories, Inc., Saginaw, Mich.; filed Apr. 30, 1945; cleaning and washing compound; since Apr. 3, 1945.

493,687. The Irwin-Newman Products Corp., Brooklyn, N. Y.; filed Dec. 21, 1945; soapless cleaning powder; since October 1945.

500,430. U. S. Industrial Chemicals, Inc., New York, N. Y.; filed Apr. 17, 1946; organo-silicon compounds; since Mar. 31, 1944.

501,216. Tobacco By-Products and Chemical Corp., Louisville, Ky.; filed Apr. 30, 1946; fumigants; since Mar. 18, 1946.

501,699. Vermex Co. of America, Glendale, Calif.; filed May 8, 1946; insecticides; since Nov. 1940.

507,086. Swift & Co., Chicago, Ill.; filed Aug. 8, 1946; agricultural sulphur chemicals used as soil fumigant, insecticides and fungicides; since Feb. 13, 1941.

507,141. P & H Products, Inc., Memphis, Tenn; filed Aug. 9, 1946; paint cleaners:; since June 28, 1946.

507,571. The Carter's Ink Co., Cambridge, Mass.; filed Aug. 17, 1946; latex adhesive; since June 1936.

507,850. The Resinous Products & Chemical Co., Philadelphia, Pa.; filed Aug. 22, 1946; solutions of synthetic organic thermoplastic resins being in the nature of laquers; since Sept. 14, 1934

510,172. Heyden Chemical Corp., New York, N. Y.; filed July 17, 1947; saccharin, the sodium salt of saccharin; since Nov. 8, 1894.

510,334. James Lyle Miller, New York, N. Y.; filed Oct. 5, 1946; chemicals used for moth-proofing; since July 18, 1946.

511 ,472. Help, Inc., Chicago, Ill.; filed Oct. 25, 1946; general household cleaning preparation with incidental water softening properties in powder or liquid form; since Sept. 15, 1925.

512,611. Rodael Products Co., New York, N. Y.; filed Nov. 14, 1946; plastic varnishes; since Nov. 4, 1946.

513,613. Dunlop Tire and Rubber Corp., Buffalo, N. Y.; filed Dec. 3, 1946; fabric cleaner, pre-wax cleaner, chrome polish; since Oct. 8, 1946.

514,856. Svenska Artiebolaget "Ratin", Stockholm, Sweden; filed Dec. 26, 1946; preparation for the extermination of rats; since 1907.

516,900. Interchemical Corp., New York, N. Y.; filed Feb. 4, 1947; flatting agents; since Oct. 9, 1946.

517,868. Pro-Phy-Lac-Tic Brush Co., Northampton, Mass.; filed Feb. 20, 1947; insect repellent; since May 22, 1944.

518,846. Monsanto Chemical Co., St., Louis, Mo.; filed Aug. 11, 1947; synthetic resins; since Feb. 25, 1947.

521,252. Goodwin Laboratories, Inc., New York, N. Y.; filed Apr. 24, 1947; insecticides; since Apr. 22, 1947.

523,901. The Mabex Co., Philadelphia, Pa.; filed June 10, 1947; moth cakes and crystals, and deodorants; since 1932.

523,973. Mido Products, Torrance, Calif.; filed June 11, 1947; deodorant and disinfectant compositions; since Apr. 1, 1947.

525,304. Darworth, Incorporated, Simsbury, Conn.; filed July 1, 1947; insecticides; since June 11, 1947.

525,922. National Carbon Co., Inc., New York, N. Y.; filed July 3, 1947; accelerator for synthetic resin cements; since 1944.

526,741. Church & Dwight Co., Inc., New York, N. Y; filed July 5, 1947; bicarbonate of soda; since Oct. 14, 1896.

526,987. H. M. Sinclair, Jr., Toledo, Ohio; trustee for Sinclair Manufacturing Co.; filed July 5, 1947; liquid chemical deodorizer, bleach, disinfectant, and sterilizer; since Oct. 15, 1929.

526,988. The H. M. Sinclair, Jr., trustee for the partnership, The Sinclair Manufacturing Co., Toledo, Ohio; filed July 5, 1947; lye; since Jan. 1, 1932.

527,108. Glyco Products Co., Inc., Brooklyn, N. Y.; filed July 5, 1947; emulsifier; since June 5, 1947.

528,729. Kelco Company, San Diego, Calif; filed July 16, 1947; a powdered algin product; since July 1930.

528,853. Andersen Specialty Mfg. Corp., Chicago, Ill.; filed July 18, 1947; liquid preparation for cleaning paint brushes; since March 1939.

529,335. American Cyanamid Co., New York, N. Y.; filed July 24, 1947; folic acid; since July 15, 1947.

529,678. National Gypsum Co., Buffalo, N. Y.; filed July 26, 1947; paint; since Sept. 1931.

531,831. Patek Brothers, Inc., Milwaukee, Wis.; filed Aug. 19, 1947; varnish; since Jan. 9, 1928.

531,856. James B. Sipe & Co., Pittsburgh, Pa.; filed Aug. 19, 1947; mixed paint and paint thinners; since Oct. 9, 1936.

532,871. Patek Brothers, Inc., Milwaukee, Wis.; filed Aug. 29, 1947; varnish; since July, 1927.

533,571. E. F. Houghton & Co., Philadelphia, Pa.; filed Sept. 5, 1947; textile sizing and finishing agent; since May 20, 1946.

533,573. E. F. Houghton & Co., Philadelphia, Pa.; filed Sept. 5, 1947; water repellent textile finishings; since Dec. 5, 1945.

534,473. Rohm & Haas Co., Philadelphia, Pa; filed Sept. 13, 1947; synthetic resinous materials; since Aug. 6, 1947.

535,548. J. F. Kurfees Paint Co., Louisville, Ky.; filed Sept. 24, 1947; prepared or ready-mixed liquid paint; since Jan. 1, 1909.

535,550. J. F. Kurfees Paint Co., Louisville, Ky.; filed Sept. 24, 1947; prepared or ready-mixed liquid paints; since Jan. 1, 1908.

537,672. Eston Chemicals, Inc., Los Angeles, Calif.; filed Oct. 13, 1947; insecticides; since Sept. 19, 1947.

538,816. Rohm & Haas Co., Philadelphia, Pa.; filed Oct. 23, 1947; water soluble resinous materials; May 1, 1947.

538,851. The Baker Castor Oil Co., Bayonne, N. J.; filed Oct. 24, 1947; stabilizers for vinyl chloride polymers and copolymers; since Sept. 9, 1946.

539,193. Monsanto Chemical Co., St. Louis, Mo.; filed Oct. 27, 1947; chemical toxicants for use as fungicides, preservatives, and insecticides; since Sept. 30, 1947.

539,194. Monsanto Chemical Co., St. Louis, Mo.; filed Oct. 27, 1947; herbicides; since Oct. 15, 1947.

540,128. Woolfolk Chemical Works, Ltd., Fort Valley, Ga.; filed Nov. 4, 1947; insecticides and fungicides; since February, 1937.

Trademarks reproduced and described include those appearing in Official Gazette of U. S. Patent Office, March 23-April 13.

482,777

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R-V
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ZENITH
526,741

CRAF COLOR
529,678

TETRON
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CRYSTALLOSE
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Pro-phy-lac-tic
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Reactions of SO_3—Comprehensive, selected abstracts and bibliography compiled by General Chemical Research.

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GENERAL CHEMICAL DIVISION

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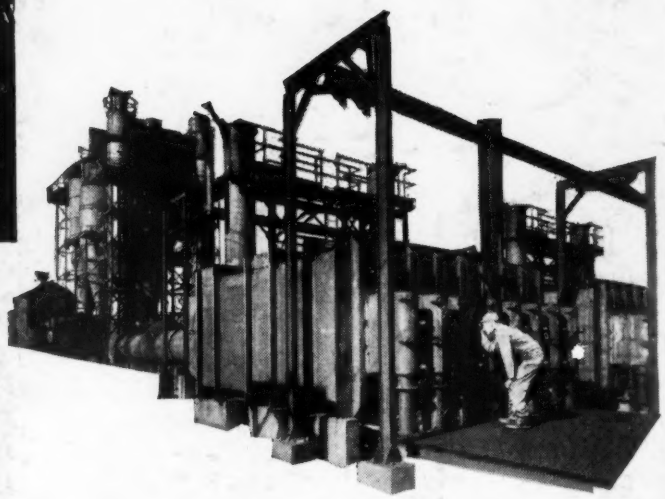
CHANNEL AND FURNACE BLACKS

...to meet your needs

Night and day millions of tiny flames deposit carbon upon steel channels to produce Witco channel blacks.



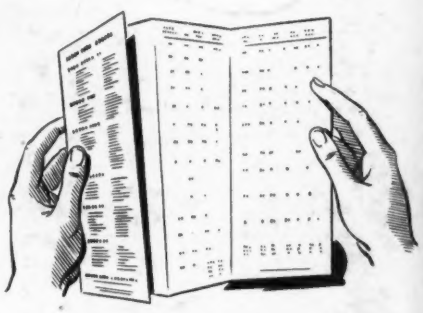
Carefully controlled burning conditions in furnaces such as these insure uniformly high quality Witco furnace blacks.

Witco offers a complete line of high quality carbon blacks to meet the most exacting requirements of the rubber, paint, ink, plastics, paper, and other industries. In every important classification of channel or furnace black, there is a Witco product at your service.

Samples of Witco carbon blacks are available for evaluation by your own technical staff. The new data sheet offered below will help you in requesting the samples suited to your needs.

New Data Chart on Carbon Blacks...

Send for the new Witco quick reference chart of leading carbon blacks and their important properties. It will save you time and assist you in selecting carbon blacks for your specific requirements.



WITCO CHEMICAL COMPANY, Manufacturers and Exporters

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